Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS**

Founded 1896

Chicago, April 11, 1931 | Issued Every Other Week | Volume XXXIV, No. 8

Member of A. B. C. (Audit Bureau of Circulations) and of A. B. P. (Associated Business Papers). The Oldest Publication and Recognized Authority in This Industry. Net Printing of This Issue 6,000 Copies.

IN ENGLAND —this plant uses Dorr Slurry Mixers

At Shipton-on-Cherwell, Oxford, England, the Oxford & Shipton Cement Company, Ltd., operates six Dorr Slurry Mixers in the fine plant pictured above. The Slurry Mixers can be seen just behind the building at the left.

Using a combination of air and mechanical agitation, Dorr Slurry Mixers are most economical units for your storage and correction basins. They maintain a uniform mix throughout the whole basin. There is no stratification. And, on account of their distinctive design features, power required to operate the Mixers is usually less than 1 H. P. per 1,000 cu. ft. capacity.

Another special feature of Dorr Slurry Mixers is a trouble-free, non-plugging type of air nozzle.

We will be glad to send cement mill men further information about these dependable Slurry Mixers. Ask our nearest office for Bulletin 1181.

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Have you investigated the most modern method of grinding raw materials—the Dorr closed circuit grinding system? Write for details.

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Contents for April 11, 1931

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We are now sole agents for its manufacture and sale

This Conveyor, which is designed to handle hot, abrasive, dusty materials, has been in continuous operation for 8 years.

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Another writes, *"So far as we know from our own experience, there is no other type of conveyor which will handle such hot materials as economically as does this one, or at so low an installation cost."*

The Conveyor consists of a tube, in which are cast screw flights, the whole revolving on rollers. There are no internal bearings. There is no relative motion between the screw flights and the tube. Consequently, there is practically no wear, regardless of the character of the material being conveyed. **Any desired number of feed and discharge points can be obtained.**

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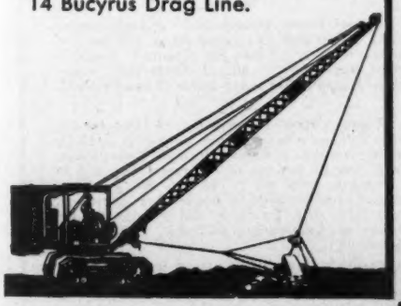
Preformed Wire Rope has hundreds of applications where it will return 30% to 300% increased service depending on the nature of the service and the character of the equipment. Write us. Tell us your wire rope problems. Over eight years of experience enable us to guarantee whether or not Tru-Lay Preformed Wire Rope will return more wire rope service for your dollar. Address:

100% Increased Service

310 hours with Tru-Lay as against 154 hours with ordinary wire rope is the experience of this Michigan Contractor.

Tru-Lay Preformed Wire Rope in this case operated a 2 Yard Page Class H Bucket on a Class 14 Bucyrus Drag Line.



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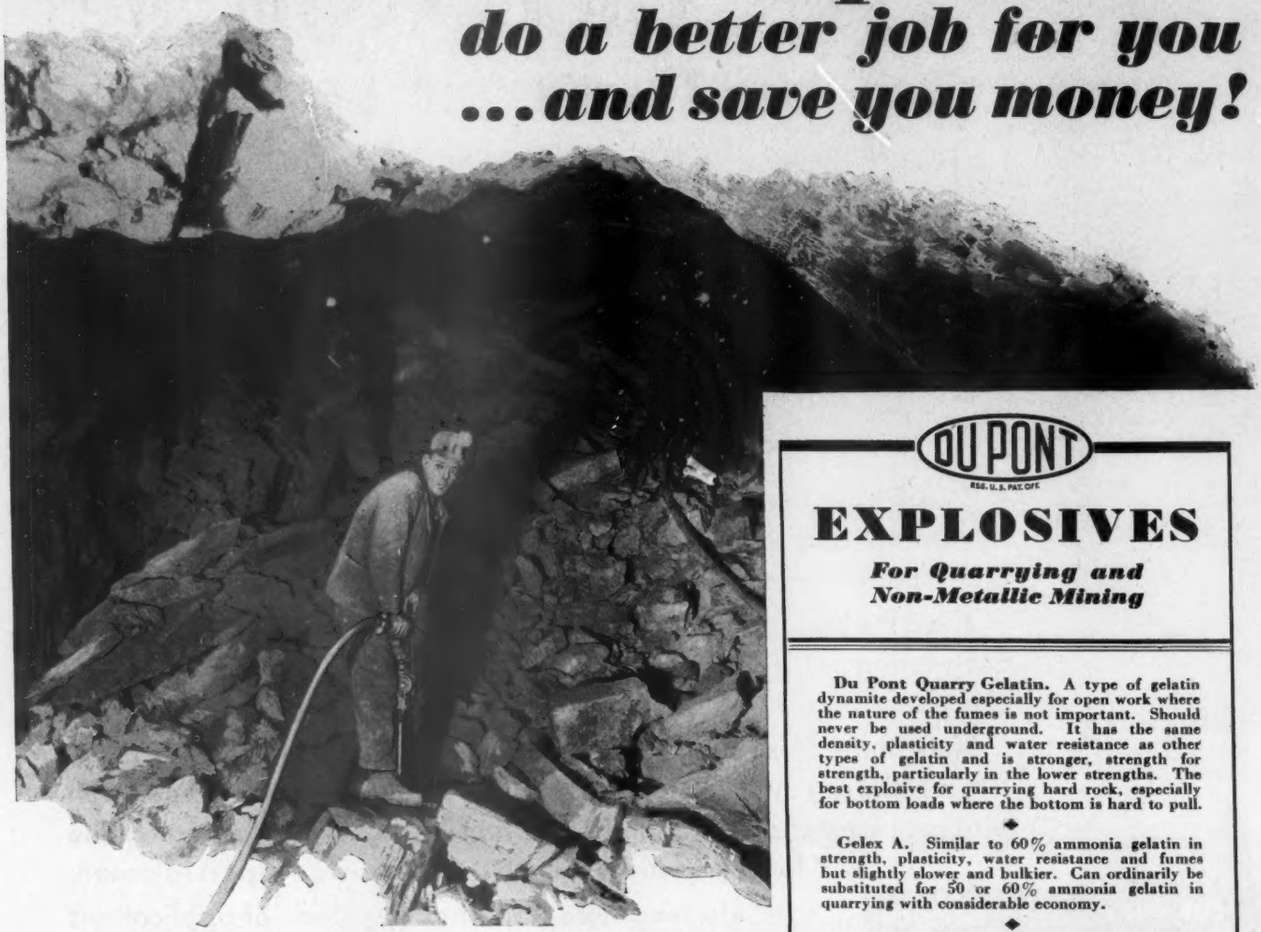

There is a du Pont Explosive *specifically designed for your job*

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The du Pont Company publishes a series of bulletins dealing with methods of blasting. We shall be glad to place your name on our lists to receive these bulletins.

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◆

Gelex A. Similar to 60% ammonia gelatin in strength, plasticity, water resistance and fumes but slightly slower and bulkier. Can ordinarily be substituted for 50 or 60% ammonia gelatin in quarrying with considerable economy.

◆

Gelex No. 1 and Gelex No. 2. Intermediate in character between low-density ammonia dynamite and gelatin—cohesive and water resisting but relatively bulky. Gelex No. 1, with a bulk strength of 60%, averages 105 cartridges, 1¼″ x 8″, per 50 pounds and Gelex No. 2, with a bulk strength of 45%, averages 120 cartridges. Suited for both open and underground work. Gelex No. 2 can often be substituted with economy for 40% gelatin in mining limestone, gypsum, clay and other non-metallic minerals, and also in quarrying. Gelex No. 1 can be substituted for 60% Red Cross Extra in quarrying, also for 60% ammonia gelatin, especially where a less concentrated load is advantageous.

◆

Red Cross Extra Dynamite. A high-density ammonia dynamite, averaging from 102 to 106 cartridges, 1¼″ x 8″, per 50 pounds. Made in strengths from 15% to 60%. Moderately water resisting. Excellent for many kinds of quarry work.

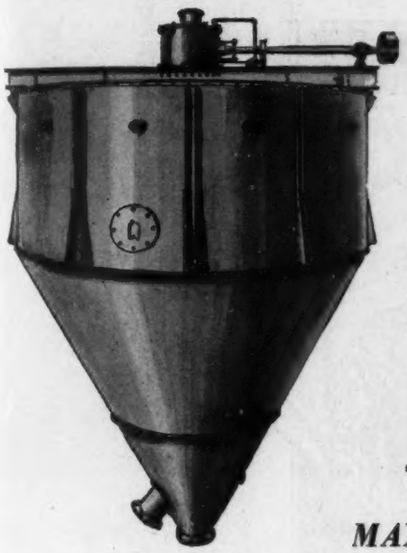
◆

Du Pont Extra Dynamite. A low-density ammonia dynamite made in five strengths, A, C, D, F and H, varying in density from 115 cartridges, 1¼″ x 8″, per 50 pounds to 172 cartridges, and in bulk strength from 63 to 20%. Fairly water resisting. Very economical for mining limestone, gypsum, clay, salt, fluorspar and phosphate; for top loads in quarrying; and for block-holing limestone.

Also made in four strengths of lower velocity, du Pont Extra D-1, E-1, F-1 and G-1, especially designed for mining limestone with a minimum of fines and with economy in shovel operation.

◆

Durox. A low-density ammonia dynamite—160 cartridges, 1¼″ x 8″, per 50 pounds—of relatively high velocity. Efficient and economical for quarrying limestone, mining salt and both quarrying and mining gypsum.



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THE BRADLEY CLASSIFIER INSURES—

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ABSOLUTE UNIFORMITY OF PRODUCT
ANY DEGREE OF FINENESS
Within the Range of Commercial Operation

IN THE MODERN CEMENT PLANT

Regardless of the Grinding Circuit Adopted, Two-Unit Reduction, Represented by the Bradley Hercules Mill and the Tube Mill, Is by Far the Most Efficient Large-Scale Grinding Method Known to the Industry.

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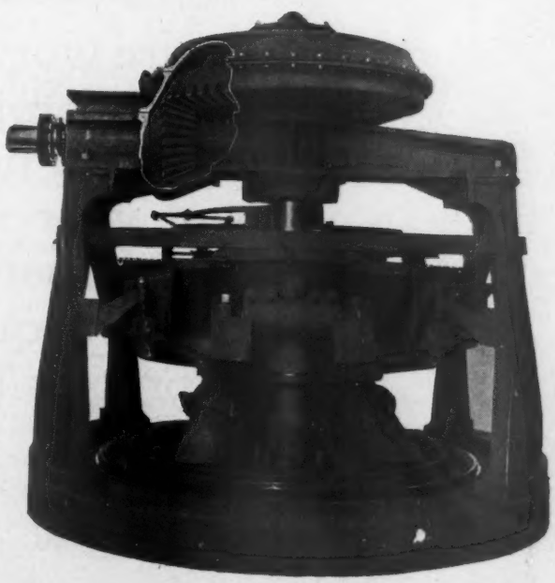

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Uses
F-M Diesel Engines

THE Harnischfeger Corporation, manufacturers of the P&H line of excavators, has adopted Fairbanks-Morse Diesel engines. This decision was reached only after exhaustive tests under actual working conditions had demonstrated conclusively the superiority of F-M Diesel power.

The performance of F-M Diesel powered P & H equipment is additional evidence that these engines are ideally adapted to the rigors of shovel and dragline service. Built on the 2-cycle principle, the Fairbanks-Morse Diesel provides an even flow of torque and an instant response to load change that is a revelation to equipment operators. Stalling is avoided as torque increases automatically with the load. Fuel costs are reduced 50 to 80 percent. Maintenance is low. No unusual skill is required. Fuel is cheap and easy to transport.

These are a few of the advantages of F-M Diesel engine power. There are others. If you are an equipment owner or manufacturer it will pay you to get the whole story. We will send it promptly upon request without obligation to you.

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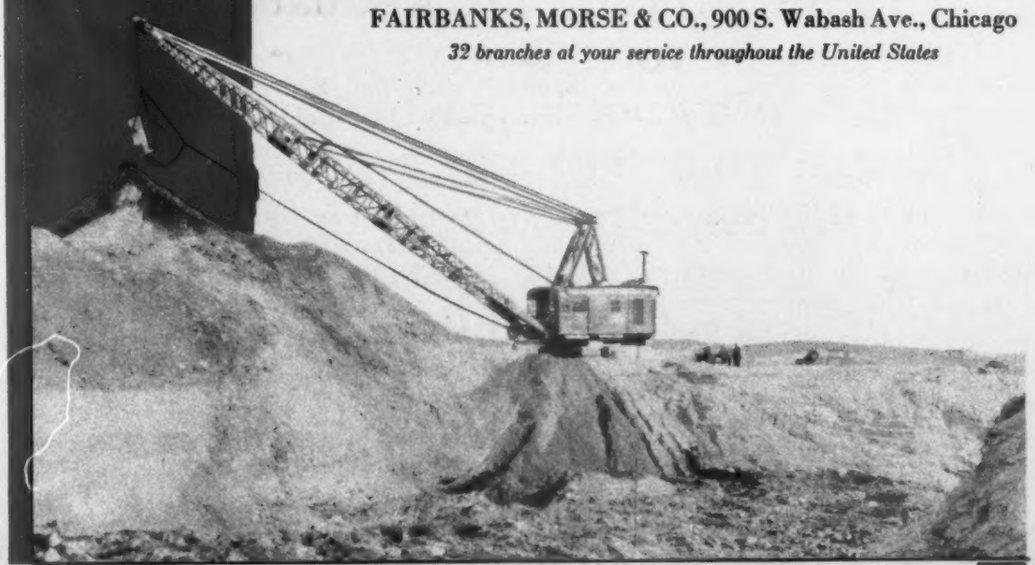


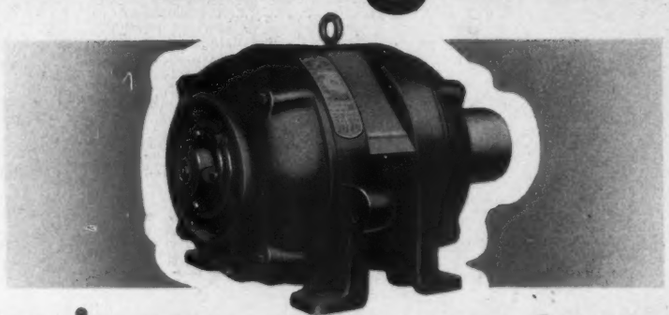
P & H Model 900 Dragline powered with a Fairbanks-Morse Diesel engine. This dragline is owned by the Rhoads Contracting Company. The job illustrated is near Delano, Penn.

FAIRBANKS-MORSE
DIESEL ENGINES
POWER, PUMPING AND WEIGHING EQUIPMENT

YES

...there is a difference in

Ball Bearing Motors



And there is one sure way to prove it!

Eighteen years ago, Fairbanks-Morse pioneered the ball bearing motor in the firm belief that the improved reliability and lower maintenance cost of this type of motor would inevitably win industry-wide acceptance. The soundness of this belief has been proved.

Today, ball bearing motors are made by practically every motor manufacturer. But this does not mean that all ball bearing motors are alike. The invaluable experience gained in eighteen years of painstaking field research is reflected in the outstanding performance that is responsible for F-M leadership in the ball bearing motor field today.

There is one sure way to prove F-M superiority. Make a comparative inspection of Fairbanks-Morse motors and other motors. Check construction details point by point. Study the advantages of F-M *sealed* bearing construction which incorporates the **highest priced ball bearings in the world** . . . *then* you will understand why users of F-M ball bearing motors specify them year after year for service that requires maximum dependability and lowest overall operating cost.

It will pay you to get the facts. Let us send literature or let a Fairbanks-Morse engineer discuss F-M motor advantages as they apply to your particular requirements. There is no obligation.

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FAIRBANKS-MORSE
MOTORS

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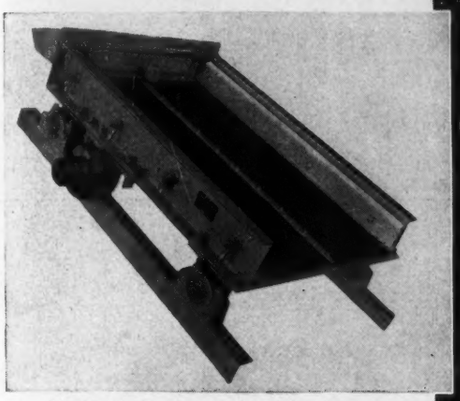
Control both in FEED and SPEED



Simple, sturdy construction, with only one actuating part, "A Triumph of Mechanical Vibration."

Effective over Full Screen Area

FEED control starts before the product comes onto the screen cloth—while the unscreened material is still in the regulating hopper at the head of the screen box.

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Full details of design, construction and operation of the Link-Belt Vibrating Screen are given in Book 862. Address

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Leading Manufacturers of Equipment for Handling Materials Mechanically and for the Positive Transmission of Power

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LINK-BELT VIBRATING SCREEN

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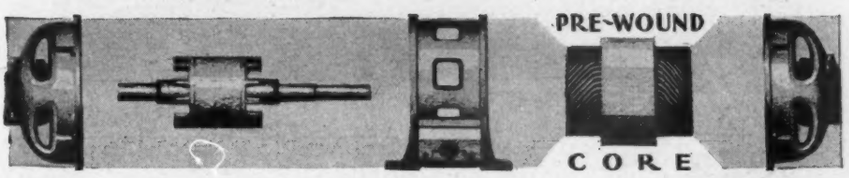
MOTOR

Announcing the THRIFTY NEW CS



TO MEET the industry's demand for a thrifty motor, Westinghouse presents a new squirrel-cage motor with a unique feature. The electrical part containing the motor windings, called the Pre-wound Core, is a unit easily and quickly renewed in all motor ratings.

The Pre-wound Core, found only in Westinghouse motors, thus introduces new speed of motor repair, new economy in spare parts stocks, advanced economies of operation, and a greater assurance of uninterrupted motor power.

The nearest Westinghouse office will gladly supply you with additional information about this motor that adds new thrift to the production of rock products.

BIG

In more ways than one

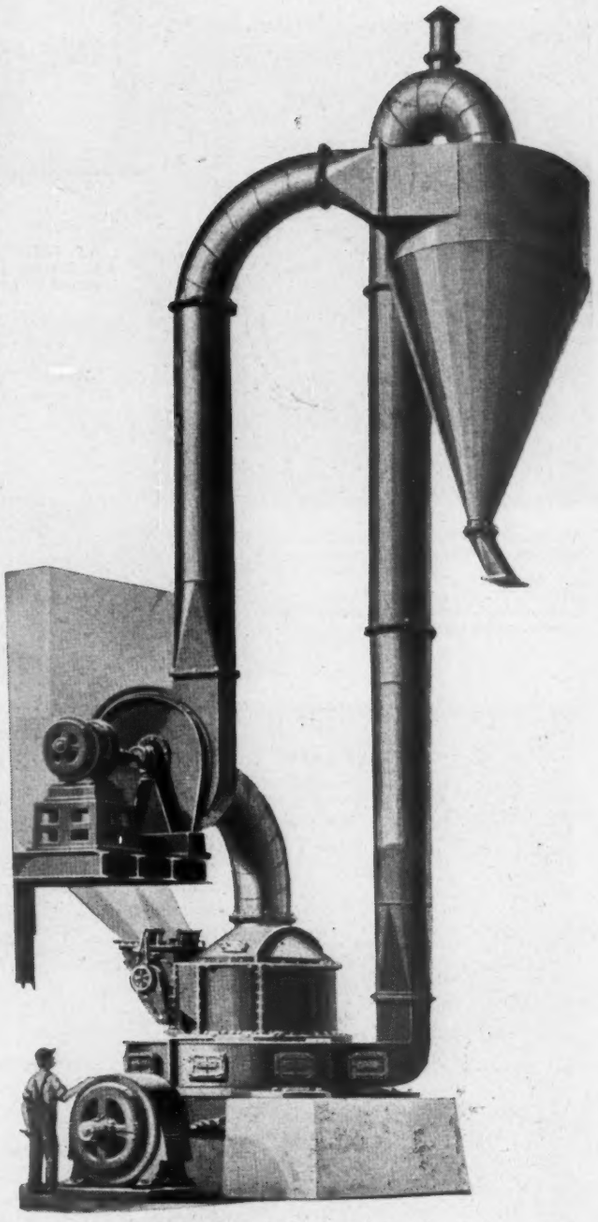
WHEN the call goes out for large scale production, the answer comes back in terms of Raymond Super Mills—10 to 40 tons per hour, according to kind of material and fineness of grind.

For producers of powdered products, the Raymond Super Roller Mill has proved to be one of the greatest developments in modern pulverizing machinery. But it offers far more than merely increased tonnage capacity.

It is *big* in efficiency, as it includes all the advantages which a single unit has over multiple units. There is but one lubrication system, one feeding hopper, one point of discharge, one material handling operation instead of many. It is *big* in economy, since the extra large working parts can stand the "grind" longer. The accumulative savings in labor, power and maintenance soon mount to big figures.

Equipped with air separation, and air drying too, if desired, Raymond Super Mills yield big profits in the drying and pulverizing of coal, gypsum, limestone screenings, mineral fertilizer and rock products in large quantities. For big plants, the installation of Super Mills is a sure way to obtain big returns on the investment.

Write for complete Raymond Roller Mill Catalog, which describes both large and small capacity pulverizing equipment.



Raymond Super Roller Mill

For maximum economy in pulverizing materials in very large amounts. Built in three sizes: No. 10, No. 15, No. 25, with a capacity range of 10, 20, 30, or even 40 tons per hour, depending on the material.

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RAYMOND

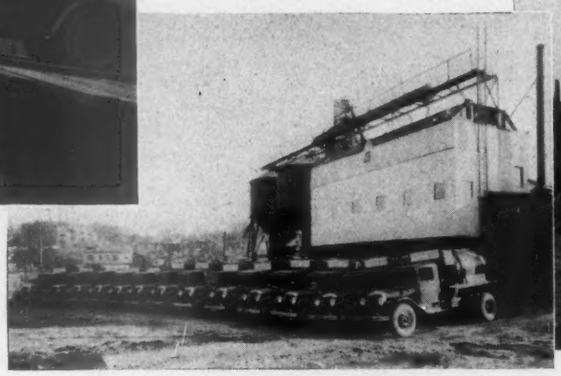
SUPER MILLS

EVERY

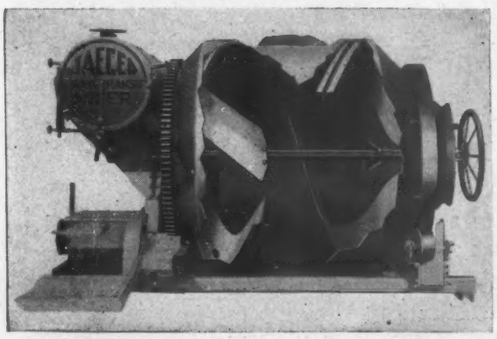
ABOVE: Discharging up-hill, quickly, cleanly, without hoist.

AT RIGHT: "Dual-Mix" Fleets, from coast to coast, operate in communities of 40,000 up.

AT RIGHT: More than 100 U. S. and Canadian cities are served by fleets of 2 to 40 units.



$2,000 Buys One Yard Mixer and Truck Complete



THE "DUAL-MIX" DRUM, with Self Cleaning Spiral Blades, Double End Cones and QUICK, UNIFORM WATER DISTRIBUTING SYSTEM, gives faster end-to-end mixing, produces concrete which commands engineering respect and highest market prices. Reversing drum gives FAST, CLEAN, CONTROLLED DISCHARGE WITHOUT TILTING.

FROM coast to coast, big cities and small, in new and old established plants, wherever there is a market for commercial concrete you will find Jaeger "Dual-Mix" fleets, product of the world's largest maker of Truck Mixers or Agitators.

By comparison, by test, by years on the job, "Dual-Mix" fleets have demonstrated their economy of operation, their superior mixing action, their 100% accurate control of water, their fast, clean, perfectly controlled discharge that meets all job conditions. Already outnumbering all others, "Dual-Mix" fleets are by far the fastest growing fleets in America today.

If you want to profit by the experience of successful operators, write or wire for prices and details, cataloged complete in "The Story of Jaeger Super-Concrete." THE JAEGER MACHINE COMPANY, Columbus, Ohio.

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THE JAEGER MACHINE CO., 603 Dublin Ave., Columbus, Ohio
Mail copy of "The Story of Jaeger Super-Concrete" with prices and complete details on Jaeger "Dual-Mix" Agitators and Concrete Plants.

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Address _____

PRODUCT OF THE WORLDS LARGEST

JAEGER AGITATORS

CAPACITIES: 2—3—4½—6 cubic yard capacities are available in "Dual-Mix" Agitators.

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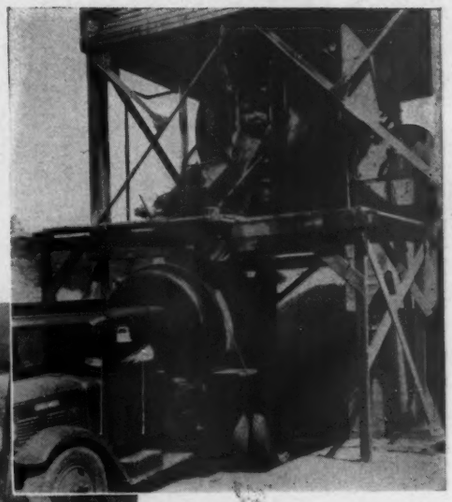

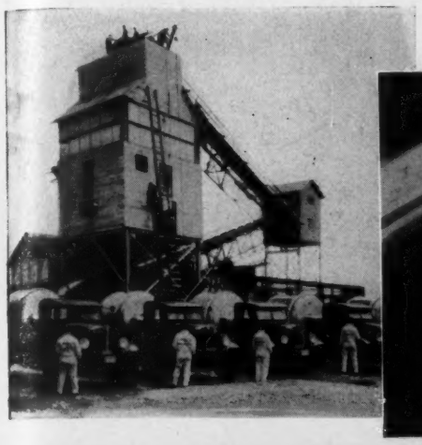

AT LEFT: Eight 3-yard "Dual-Mix" Agitators are in service at New Haven, Conn.

ABOVE: Loading "Dual-Mix" Agitator at central mix plant in Westchester, N. Y.

AT LEFT: One of eleven 3-yard Agitators on subway work, New York City.

MAKER OF TRUCK MIXERS OR AGITATORS

Dual-Mix
TRUCK MIXERS

CAPACITIES: 1—2—3—4 cubic yard capacities are available in "Dual-Mix" Truck Mixers.

I AM INTERESTED IN TRUCK MIXERS

THE JAEGER MACHINE CO., 603 Dublin Ave., Columbus, O.
Mail copy of "The Story of Jaeger Super-Concrete" with prices and complete details on Jaeger "Dual-Mix" Truck Mixers and Concrete Plants.

Name_____

Address_____

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A mid-western cement plant installed Gargoyle lubricants on two of their Grind Mills. An average power saving of 13.75 amperes—or 3.09%—resulted. This reduced friction also meant reduced repair and maintenance expense.

Gargoyle lubricants also established a cost of approximately 50% less than the cost of the lubricants previously used.

From Vacuum Oil Company File No. 1209

VACUUM organized lubrication service represents a known value because it achieves economies like this. It supplies the right oil to the right place in the right way. Vacuum co-operation with engine and machinery builders, plus 65 years' experience with world-wide industry—enables us to lubricate correctly, every industrial machine.

You incur no obligation by asking the Vacuum representative to suggest possible economies in *your* lubrication. Address Main Office, 61 Broadway, New York. Branches and distributing warehouses throughout the world.

The following benefits result from Correct Lubrication:

1. Reduced friction
2. Reduced power consumption
3. Continuity of production
4. Reduced maintenance costs
5. Prolonged useful life of machinery
6. Reduced ultimate cost of lubricants and labor of applying them
7. Reduced total production costs

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Lubricating Oils

The world's quality oils for plant lubrication

Send for one or all of the above technical treatises on lubrication.

VACUUM OIL COMPANY

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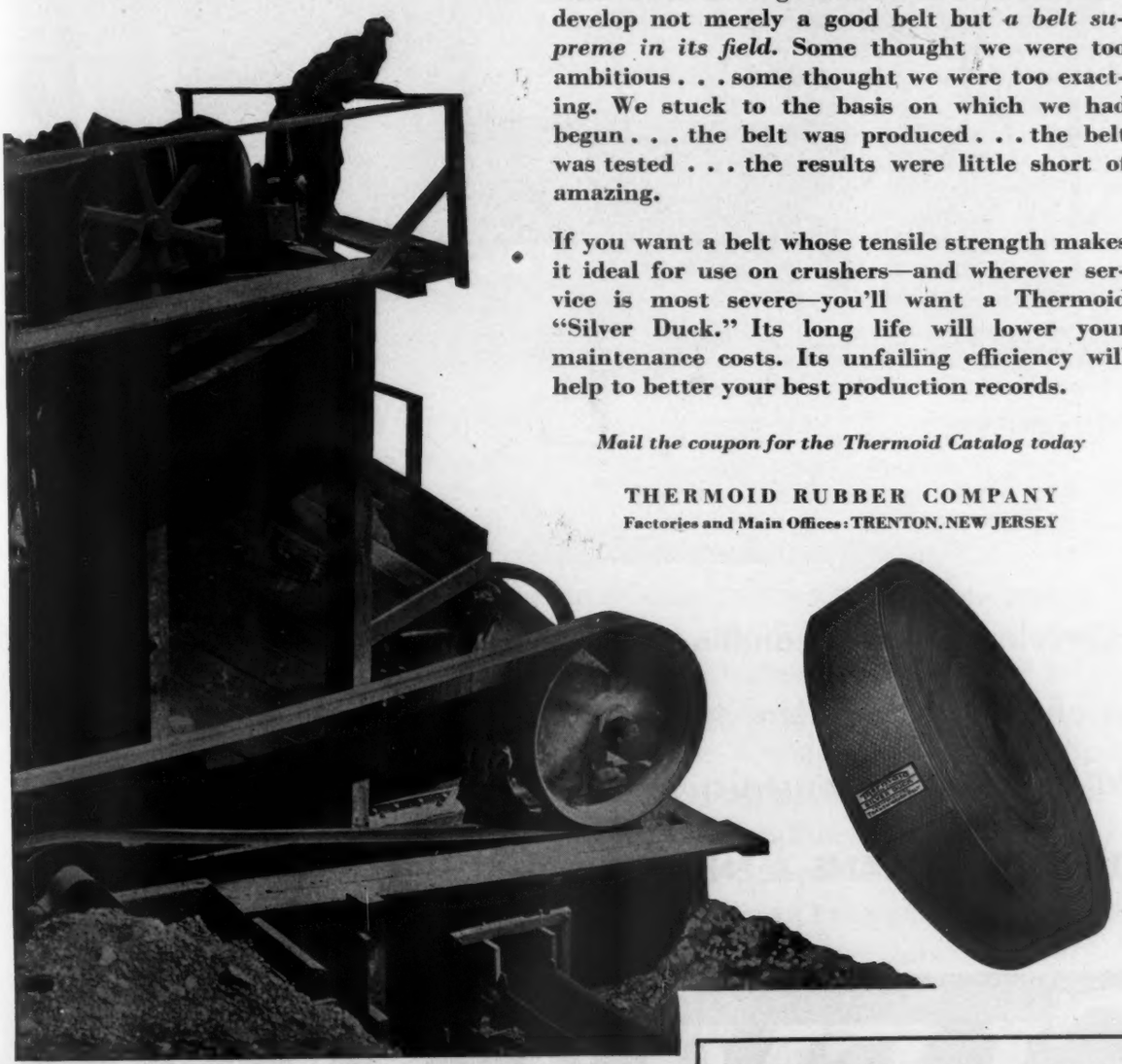
If You're as Exacting as we are— *You'll* Want a Silver Duck Transmission Belt for Your Crushers



We began the original tests and experiments on Silver Duck Belting with the determination to develop not merely a good belt but *a belt supreme in its field.* Some thought we were too ambitious . . . some thought we were too exacting. We stuck to the basis on which we had begun . . . the belt was produced . . . the belt was tested . . . the results were little short of amazing.

If you want a belt whose tensile strength makes it ideal for use on crushers—and wherever service is most severe—you'll want a Thermoid "Silver Duck." Its long life will lower your maintenance costs. Its unfailing efficiency will help to better your best production records.

Mail the coupon for the Thermoid Catalog today

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and **BRAKE LINING**

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Gentlemen:
I am interested in Thermoid products. Please send me your catalog.

Name .....

Address .....

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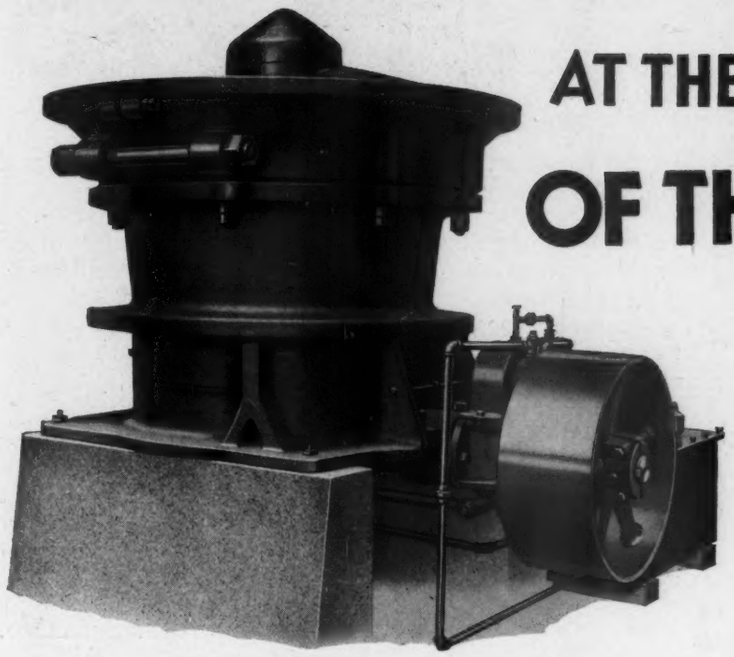
WHAT HAPPENS AT THE TOP OF THE BOWL?



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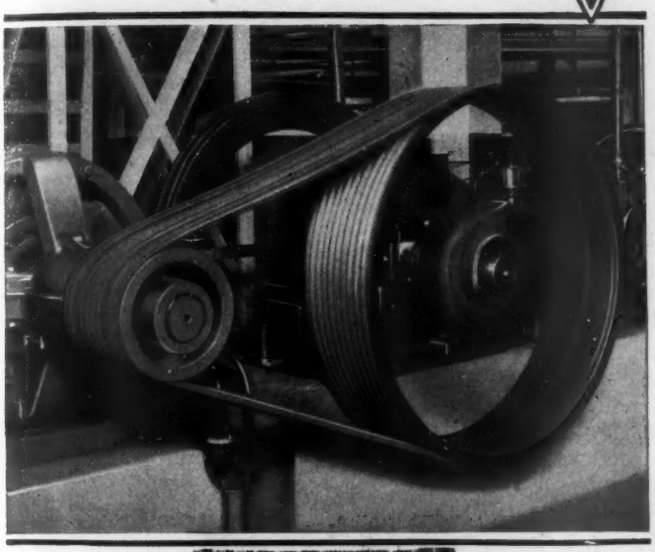

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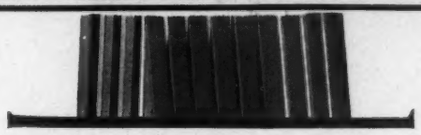

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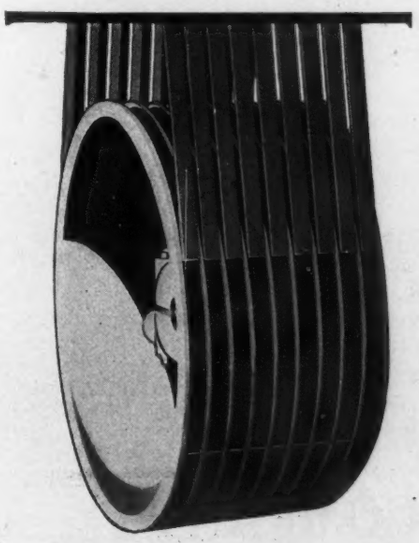

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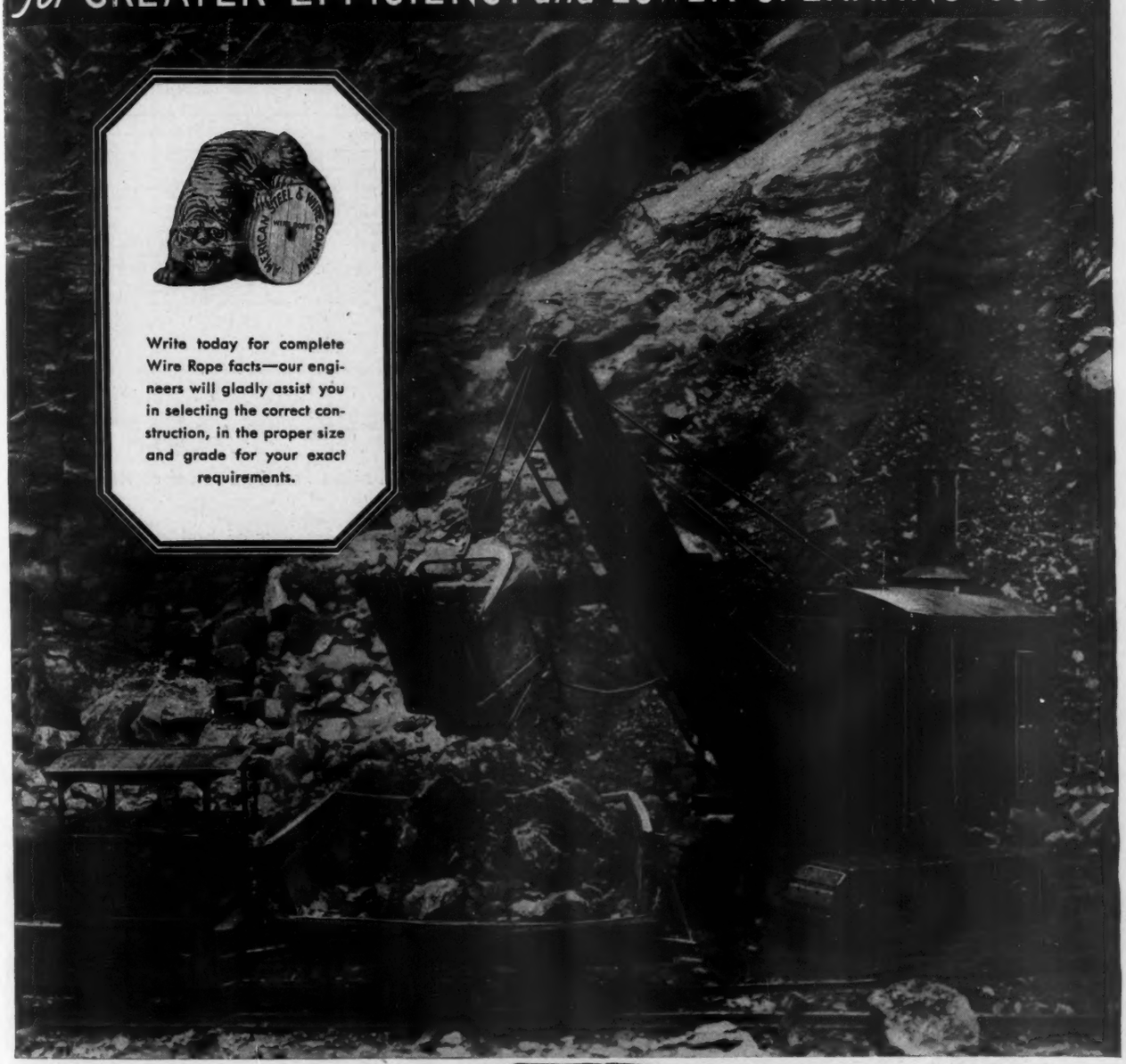

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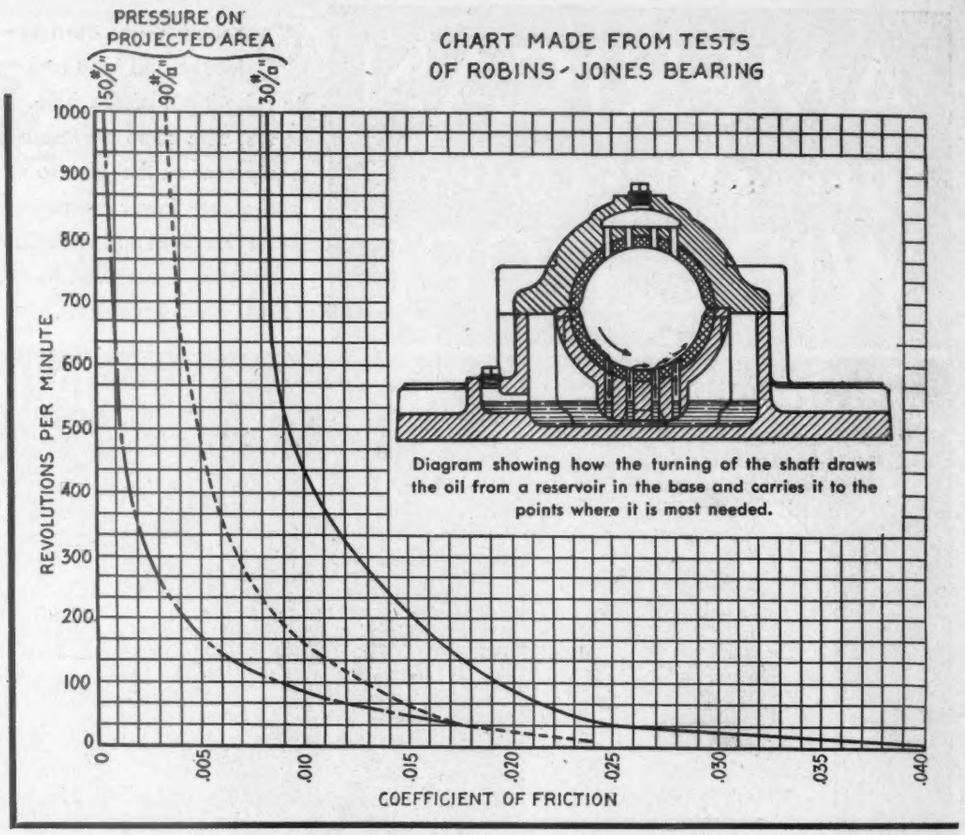

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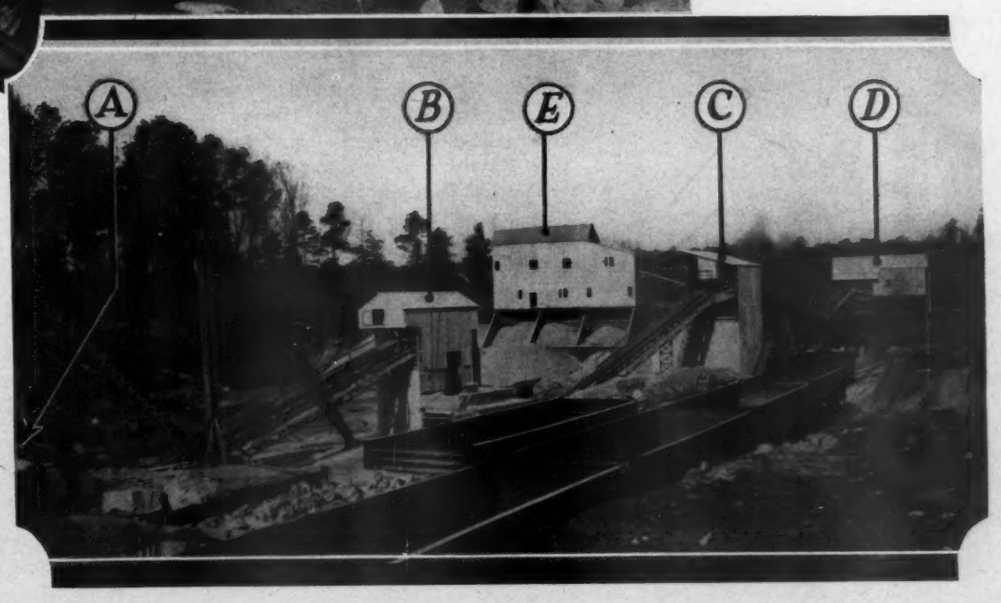
Rock Products
With which is incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXIV | Chicago, April 11, 1931 | Number 8

Newest Crushed Stone Operation in the South

Weston and Brooker Co. Has Put the Results of Many Years' Engineering and Operating Experience into New Plant at Camak, Georgia



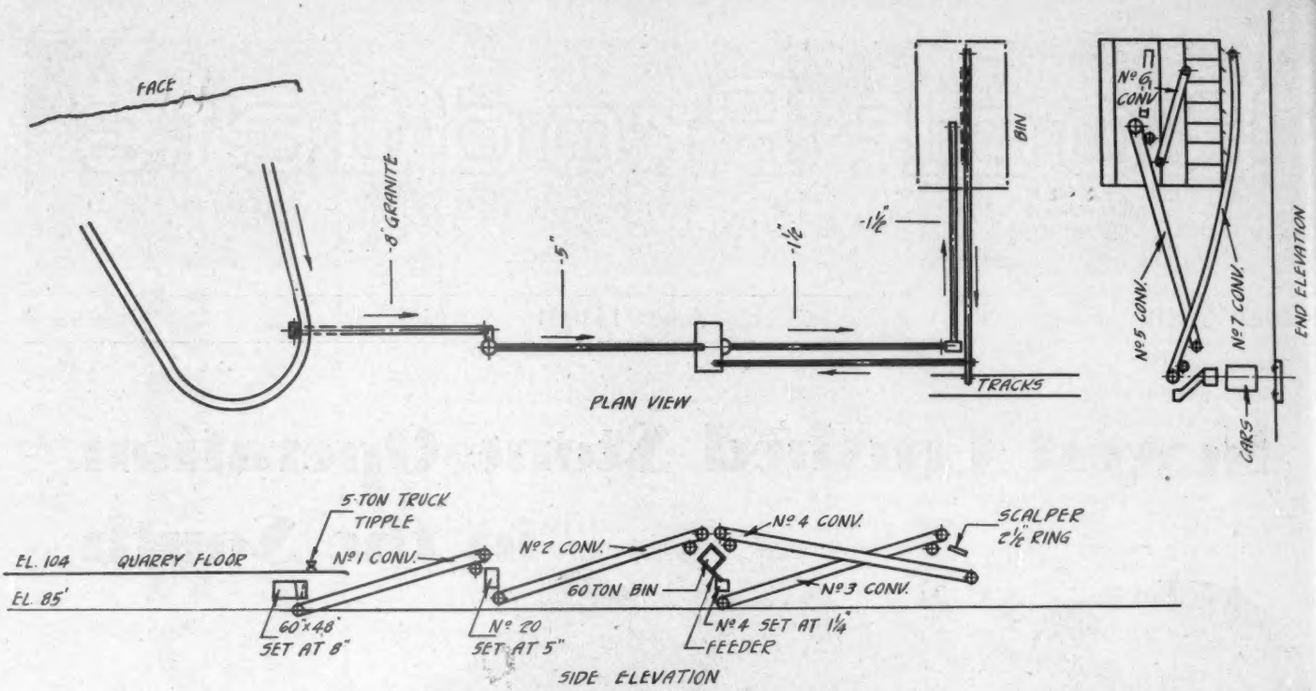
(A) Primary crusher. (B) Secondary crusher. (C) Finishing. (D) Scalper screen and loading. (E) Screen house and storage

THE FIRST QUESTION that occurs to a visitor is how this granite deposit came to be discovered, for there is no evidence of it in the surrounding landscape. The country is rolling, and where farming can be done, a little cotton is raised, but for the most part it is a rather barren area with a few small towns connected by improved dirt roads.

The firm of Weston and Brooker, well-known and experienced operators of granite quarries in South Carolina, sensing a demand for crushed hard stone in eastern Georgia, made a very thorough search of the countryside for a near outcrop of granite which, they were convinced, must exist. The grnite that they have uncovered and are developing at Camak, Ga., is not only of excellent quality for commercial crushed stone, meeting all state and federal specifications, but it is so situated that the operators are able to serve a large market area through the Georgia Railroad, which has lines radiating in seven directions from or near Camak.

The quarry is about five miles due east of Camak, and the territory reached includes not only eastern Georgia but western and southern South Carolina.

The rock is a coarse-grained granite resembling the other Georgia granites in the Lithonia, Rock Chapel and Stone Mountain districts near Atlanta and undoubtedly could be quarried for dimension and monumental stone.



Flow sheet of materials from quarry to delivery

The company controls some 140 acres, of which 14 acres has been stripped or is covered with only a few feet of top soil. It is estimated that the company has sufficient rock stripped to make at least 500,000 tons of commercial stone.

The rock tends to break in blocky fragments, as there are few recognizable stratifications. From 18 to 25 ft. of hole per day is obtained. Drilling is done at present with one Keystone well drill and one Loomis well drill, both driven by General Electric motors, and a battery of three S-70 Ingersoll-Rand tripod drills. Eight S-49 Ingersoll-Rand jackhammers are used for secondary drilling. The well-drill holes are 6 in. in diameter and are drilled to 5 ft. below the quarry floor. The holes have a burden of 18 ft. and are spaced on 25-ft. centers and loaded with 60% du Pont dynamite, so as to net approximately 5 tons of stone per pound of explosive. The amount of powder for primary blasting is small compared to other operations, but, as already stated, results in rather large, blocky fragmentation, so that considerable secondary drilling and blasting are required. It is stated that no matter how large the primary charge, the nature of the rock is such as to make this method of blasting the more economical.

Derrick with hook for dumping cars, and portable acetylene generator

The tripod drill holes are spaced on 8-ft. centers with 10-ft. burden, using about the same charge of dynamite as the well-drill holes.

Cordeau-Bickford fuse is used for the well-drill shots, and ordinary blasting caps and fuse for the tripod drill holes. (Incidentally, the quarry foreman gives Rock Products the credit for instructing him in the use of Cordeau-Bickford fuse.)

The quarry is of the ledge type with the crushing plant resting at the base of the hill which constitutes the granite uplift. The distance between the quarry and primary crusher at the present time averages about 300 ft., with a maximum haul of about 400 ft. The present height of the quarry face is approximately 45 ft.

When the quarry is sufficiently developed to have a face 70 ft. high, the average haul will be approximately 600 ft. Ultimately a total height of approximately 90 ft. for the quarry face will be reached.

At present four Mack motor trucks equipped with 7½-ton Easton side-dump bodies are used for hauling the stone from the quarry to the primary crusher. Loading is done with a Marion, No. 37 steam shovel on crawler treads, using a 2½-yd. bucket. Another shovel, a Marion 480, steam-operated 2-yd., has recently been added to bring the capacity of the plant up to its rating of 3000 tons per 10-hr. day.

As the quarry is developed, it is planned to pave the motor truck routes from the quarry face to the primary crusher with bituminous paving material. The quarry

This shows that considerable secondary blasting is necessary

and plant are provided for night work with a battery of electric flood lights.

The primary crusher consists of a 48- by 60-in. Power and Mining Machinery Co. jaw crusher, a 20-in. Allis-Chalmers gyratory secondary crusher and a 4-ft. Symons cone recrusher or finishing crusher. No elevators are used, belt conveyors being depended upon entirely for elevating and conveying. All screening is done dry, but washing or rinsing is provided for the stone as it is being loaded out of the bins.

Feeding of the secondary crusher is regulated and made uniform by means of a Ross chain feeder which is said to have proved very satisfactory.

The screening equipment of the plant consists of a 4- by 10-ft. Niagara vibrating screen used as a scalper and a 60-in. by 24-ft. Allis-Chalmers rotary screen supplemented by three Hum-mer vibrating screens for sizing.

Seven belt conveyors provide for connecting the various units.

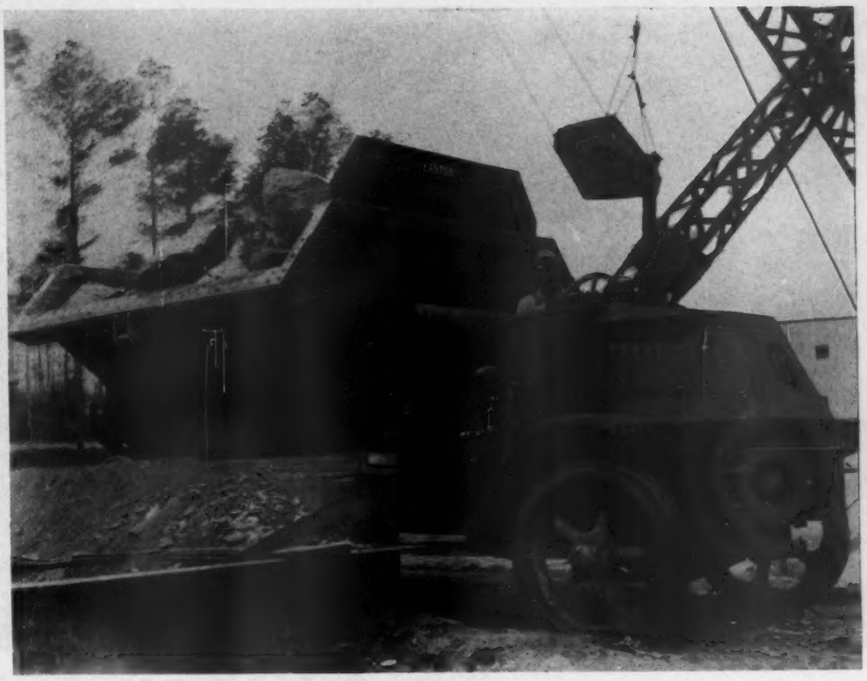
The single-decked Niagara scalping screen is suspended by four ¾-in. steel cables and is provided with 2-in. square openings. The rotary sizing screen has 12 ft. of 1-in., 6 ft. of 1¼-in., and 6 ft. of 1½-in. perforated round openings.

The processing of the stone in the plant is accomplished by five main units: (1) primary crusher; (2) secondary crusher; (3) feed bins and recrusher; (4) scalping screen and loading equipment, and (5) screening house with storage bins below.

Belt conveyor No. 1 (42-in.) connects the primary crusher with the secondary; conveyor No. 2 (30-in.) delivers the stone from the secondary crusher to the feed bins over the finishing crusher; conveyor No. 3 (24-in.) delivers the stone from the finishing crusher to the scalping screen; conveyor No. 4 (24-in.) returns the oversize from the scalping screen to the finishing crusher; conveyor No. 5 (24-in.) delivers the throughs from the scalping screen to the rotary sizing screen, and conveyor No. 7 (30-in.) is the reclaiming belt running below the steel storage bins. In addition there is a short 16-in. belt conveyor for delivering a part of the product from the rotary screen to the Hum-mer vibrating screens for further separation. The head pulleys are all rubber lagged.

All belt conveyors use Link-Belt carrier and return rolls and are Alemite lubricated. Alemite lubrication has been applied also to practically all other equipment in the plant.

With the exception of the reclaiming belt conveyor, all conveyors are designed for standard 15-hp. General Electric mo-



Truck at primary crusher

General view of quarry from the screen house

Stiff-leg derrick used to feed primary jaw crusher

tor drive through Worthington rubber "V" belt drives. The conveyors are designed to run at variable speeds from 175 ft. to 300 ft., to provide for the varying output of the plant; this is, they are operating at the initially low speed of 175 ft. per minute with the expectation of speeding them up to 300 ft. when the full capacity of the plant is realized.

There are several novel and unusual features in this plant which will be discussed in the following order: (1) truck dumping; (2) scalper; (3) recrusher; (4) storage facilities and loading.

The application of a steel stiff-leg derrick at the primary crusher is noteworthy for the variety of functions it performs and is evidence of the study and ingenuity of the plant's designers.

The cables on the derrick are so reeved that when the truck is in dumping position the hoist operator, in raising the hook, also automatically causes the hook to move forward as it rises, so that it engages the side of the truck body and dumps it through a single control. The crusher opening is between the truck and the hoist operator, so that he can oversee the whole operation and regulate the rate of crusher feeding.

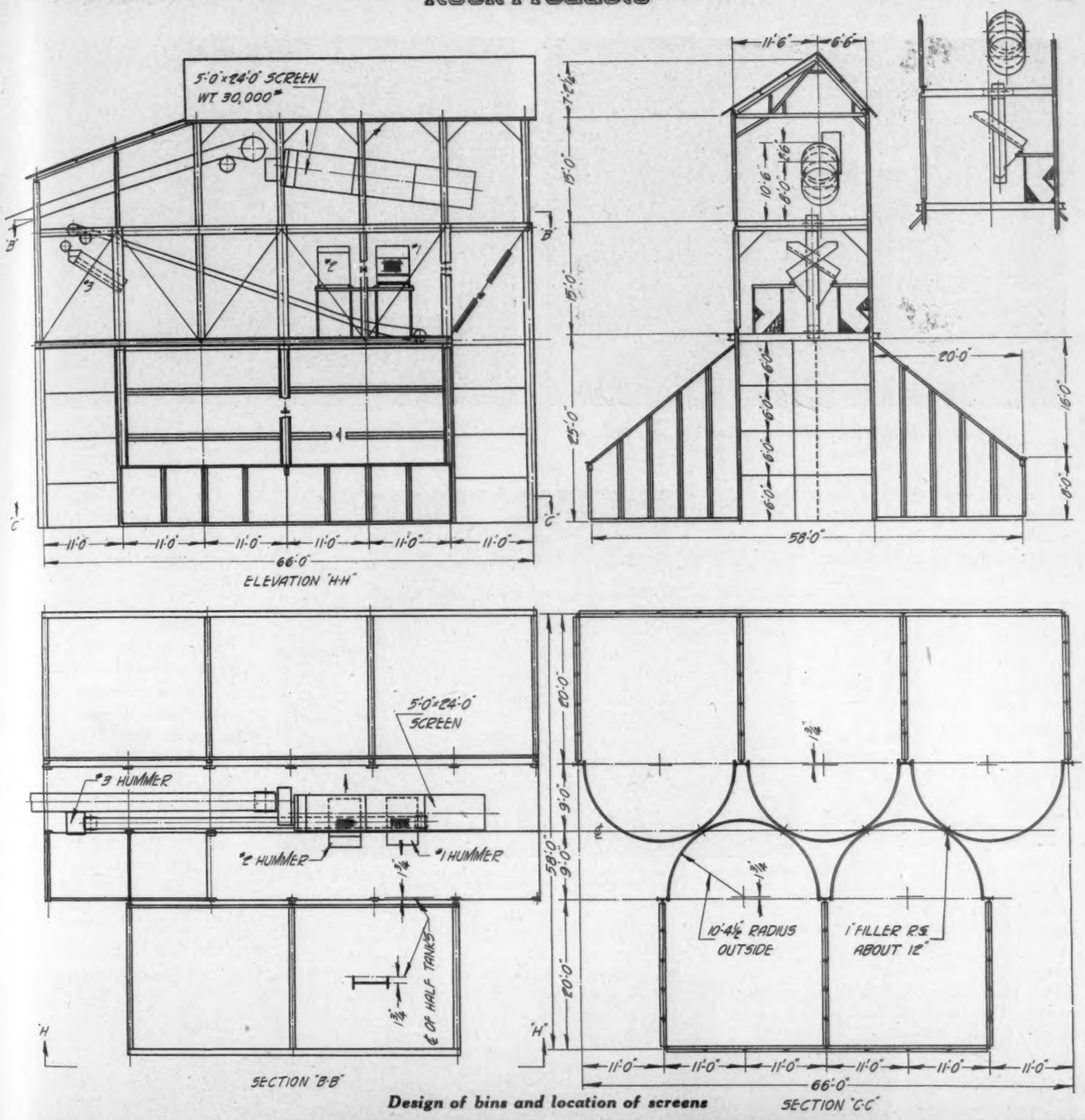
A separate line on the hoist is available for lifting heavy parts for repair work on the primary crusher. Furthermore, the derrick may be so swung as to serve as a crane in handling repair parts for the secondary crusher. The derrick thus serves as a car dumper, service crane for the primary crusher, service crane to the secondary crusher and as a service crane for dislodging large stones from the jaws of the primary crusher.

The derrick was furnished by the American Hoist and Derrick Co. and uses a 3-drum electric hoist powered by a 40-hp. induction motor.

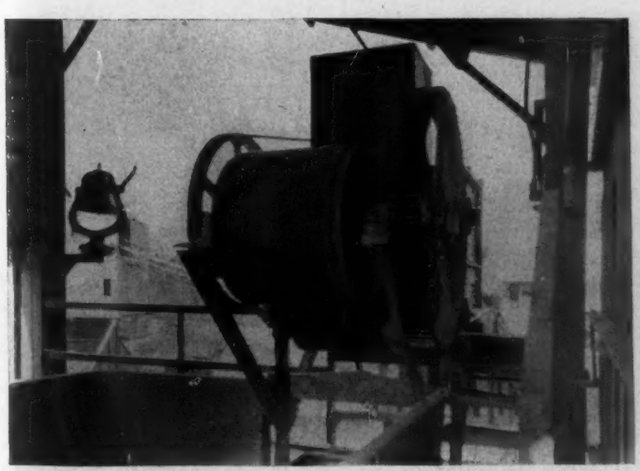
Feeding of the secondary crusher is unusual in that a bar grizzly of rather novel construction has been provided ahead of it. This grizzly is of the rail type, the bars having an 8-in. web but with the lower 6 in. of the web cut away so that the bars are non-binding. The bars are

From primary to secondary crusher

Primary screening house



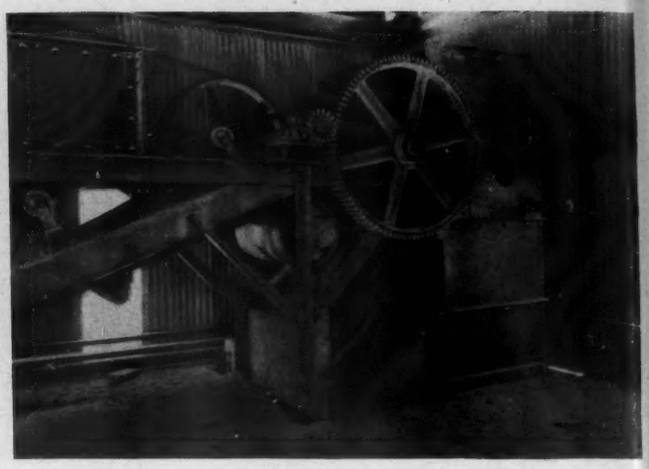
Design of bins and location of screens



Five-strand drive on belt No. 2

Motor for one of the belt drives

Drive to belt No. 3 serving vibrating screen



Drive end of reclaiming belt where it discharges to rinsing screen

set at 3-in. openings, and the throughs fall to a steel chute which feeds a belt first with the fines and then with the larger rock. These throughs thus bypass the secondary crusher and go direct to the scalping screen and finishing crusher. The drive of the secondary crusher is a 100-hp. General Electric induction motor through a Gates Vulco rope drive.

The output of the second crusher is conveyed to a steel surge bin which will run off about 60 tons through a Ross chain feeder to the 4 ft. cone crusher. The cone crusher is set normally to make 2-in. product. This surge bin is arranged to be followed by a second Ross feeder and a No. 4 cone crusher, if necessary, to meet the demand. (The open end of the surge bin was planned for receiving possibly dirty material from storage so as to get it back into the conveyor and screening system.)

One of the unique features of this finishing crusher installation, in addition to the feed arrangements, is the location of the feed bins with respect to the finished material storage piles, for by means of clamshell cranes it is possible to take any size from storage and return it to the bins and to the finishing crusher for further reduction. By referring to the drawing showing the layout of the storage piles the advantages of this arrangement are apparent.

Type of grizzly at secondary crusher

The cone crusher drive is a 100-hp. General Electric induction type through a Dayton V-cog type belt.

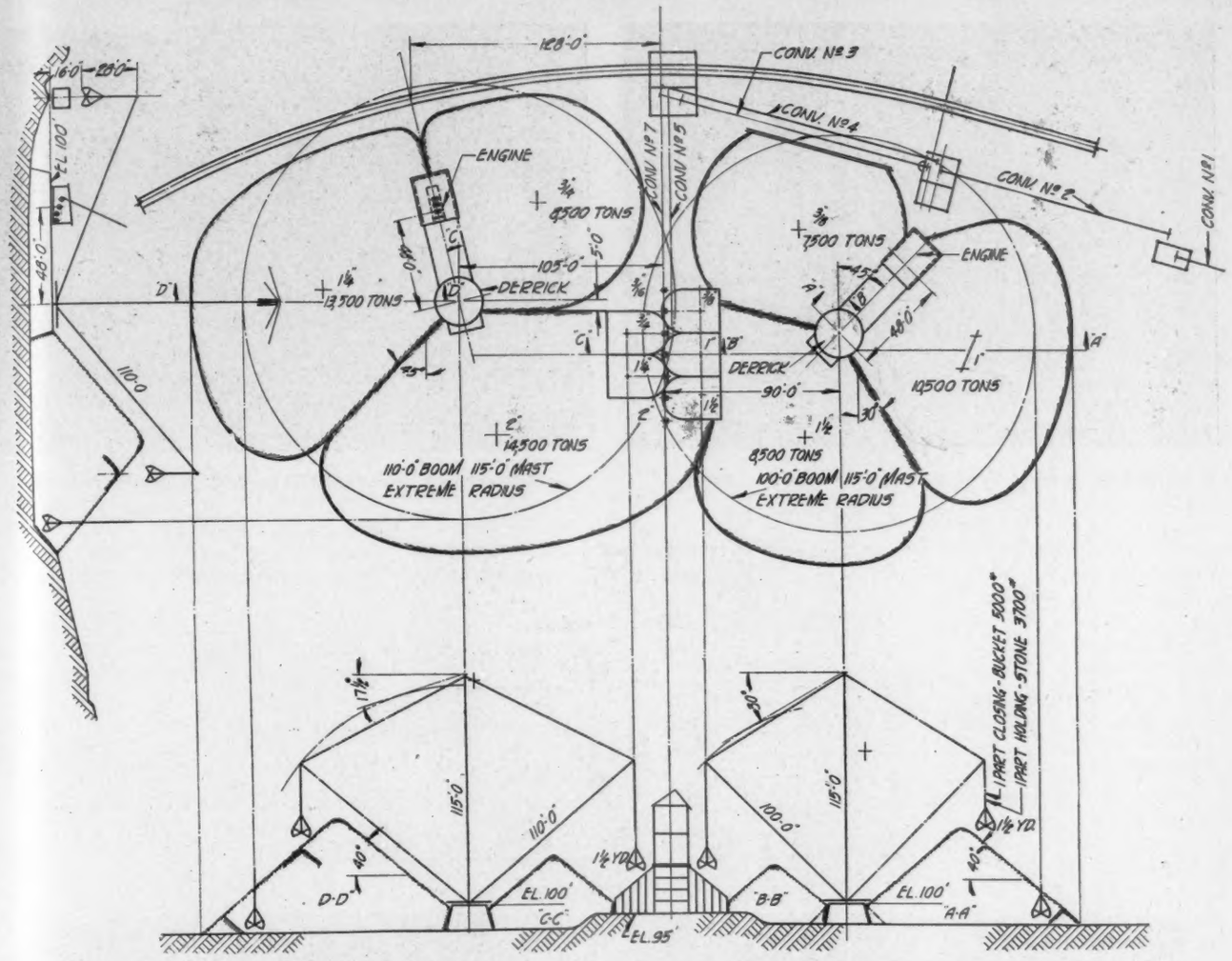
Type of foundations under conveyors

The ground storage facilities are similar to those provided at the company's Cayce, S. C., plant, which has been in successful use for several years and is an original design with the company.

Seven sizes of stone are produced by the rotary screen and the three vibrating screens: 2-in., 1½-in., 1¼-in., 1-in., ¾-in., ⅜-in. and 3/16-in., with fines included for the smaller sizes. The minus 3/16-in. size and largest size (2-in.) fall direct to ground storage. The other five sizes fall to separate steel bins which are flat-bottomed and open at the top so that either of the two storage handling cranes can remove the finished material from the bins to ground storage when necessary. The bins hold 350 tons each.

Each bin is U-shaped with the curved portion arranged as shown in the drawing. The bins discharge to a reclaiming belt in a tunnel under the center line so that there are two means provided for emptying the bins, one to storage by means of the cranes and the other by means of draw-off gates to the belt conveyor.

It is already stated that the material in ground storage can be returned to the bins for loading out by means of the belt conveyor when so desired. Again, the



Storage diagram of new Georgia plant of Weston and Brooker Co.

cranes can move the stone from the storage piles to the bins feeding the recrusher as already noted. Cranes for this service are two stiff-leg derricks each having a 115-ft. mast and a 110-ft. boom. The storage piles are calculated to hold the following tonnages:

⅜-in.	7,500 tons
¾-in.	8,500 tons
1-in.	10,500 tons
1¼-in.	13,500 tons
1½-in.	8,500 tons
2-in.	14,500 tons

The cranes each have a 1½-yd. clamshell bucket.

Reclaiming from storage is accom-

Rotary screen, driven through speed reducer on V-belt drive

Homes for employes

Vibrating screen, the fines going to a second battery

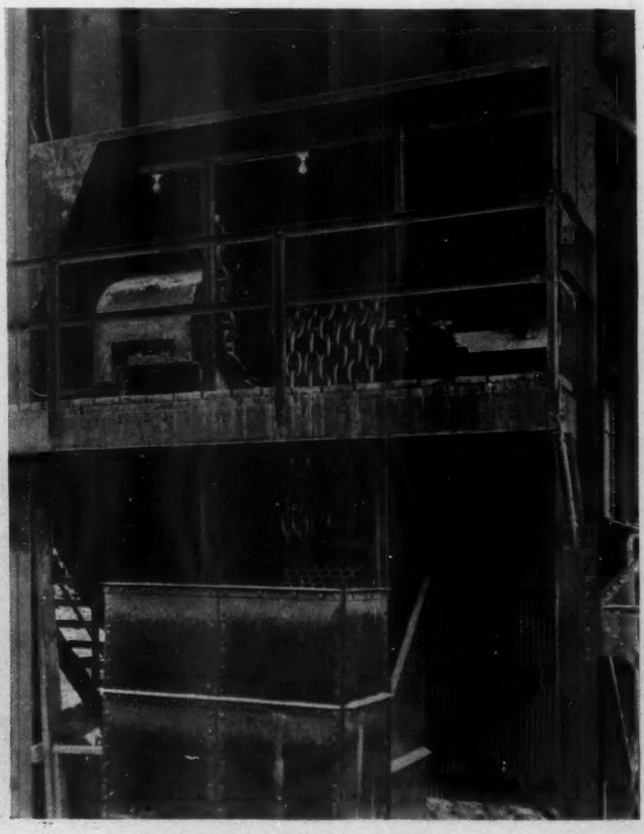
Belt feeding one of the secondary vibrating screens

plished by a 30-in. belt which carries the material back to the same structure which houses the scalping screen, where the stone is given a final rinse as it passes over a stationary 3/16-in. mesh screen to wash out any fines. The wash water and fines are carried away to waste by a steel launder. It is intended to install the same anti-segregation device as used at the

Motor Schedule

LOCATION	MAKE	HP.	LOCATION	MAKE	HP.
Primary crusher	Westinghouse	200 Induction	Belt No. 7	General Electric	7½
Secondary crusher	General Electric	100	Vibrating screen scalper	General Electric	25 7½ Induction
Cone crusher	General Electric	100 Induction	Rotary screen	General Electric	15
Hoist at primary crusher	General Electric	40	Finishing vibrating screens	Reliance	F-8 Frequency charger
Chain feeder					
Belt No. 1	General Electric	7½	Compressor	Westinghouse	200 Synchronous
Belt No. 2	General Electric	15	Water pump No. 1	Allis-Chalmers	7½
Belt No. 3	General Electric	15	Water pump No. 2	Allis-Chalmers	20
Belt No. 4	General Electric	15	2 Stiff-leg derricks	General Electric	80
Belt No. 5	General Electric	10			
Belt No. 6	General Electric	15			

Finishing crusher with chain feeder



A closer view of the chain feeder

Fine screening building with unusual storage arrangement

company's Cayce, S. C., plant, which was described in Rock Products, January 17, 1931.

The plant is connected with the main line of the Georgia Railroad by a 4-mile spur which approaches the plant on a sufficient grade to allow spotting of the cars at the loading apron by gravity. A 20-ton Glover Engine Works steam locomotive is used for plant switching.

Compressed air for the tripod and jackhammer drills is supplied by a Sullivan, Class WJ3, 18x11x14-in. compressor belted to a 200-hp. Westinghouse synchronous motor. From the compressor the air passes to a 4x12-ft. horizontal receiver through a 6-in. line. The quarry and drill sharpening equipment is served by a 4-in. line.

All motors in the plant use 60-cycle, 3-phase, 550-volt current that is stepped down from 44,000 volts by a bank of type H, Form D, General Electric transformers.

The water supply during most of the year is not a serious problem, but at times, due to drought conditions, it is necessary to use a 6,000,000 gal. storage basin constructed on top of a hill adjacent to the plant from which water can flow by gravity to places where it is used. A second 4-in. centrifugal pump is installed to fill this basin.

The Weston and Brooker Co.'s main offices are at Cayce, S. C., where it operates, as already noted, a large quarry and crushing plant, and the company also operates a third quarry at Park Hill, S. C. T. I. Weston is president of the company; W. B. Jamison, vice-president and general manager; B. O. Brooker, vice-president in charge of sales; W. S. Weston, vice-president and chief engineer; T. R. Jamison, superintendent; H. L. Bynum, field engineer.

The two screening houses

Scalping screen and loading building

New Iowa Quarry to Open

THE WINTERSET LIMESTONE CO., Winterset, Ia., was recently awarded the contract to furnish 40,000 tons of crushed rock to be used in the paving which will be laid on No. 2 west by the Des Moines Asphalt Paving Co. The company is a newly formed one, owned by Alf Danforth and Glenn Poarch, of Kingsport, Tenn. Mr. Poarch is an experienced quarryman and was formerly employed by the Pennsylvania-Dixie Cement Corp.

The new company will have its quarry on the Danforth farm three miles east of Winterset on No. 2, surveyed and laid out by Carl Cassburg, of Des Moines, an engineer of the Pennsylvania-Dixie Cement Corp. Equipment is purchased and will be installed at once.—*Winterset* (Ia.) *News.*

Electric Furnaces for Fused Cement*

First Information Available in This Country on the Manufacture of High Alumina Cement in the Electric Arc Furnace

CHIEF ENGINEER DR. M. KAUCHTSCHISCHWILI, of the department of electrical chemistry, of the Siemens and Halske Corp, Berlin, states that ever since the invention of portland cement the cement industry has endeavored to perfect this material. Especially in recent times various improvements have been introduced in the method of production of portland cement which are intended to improve its quality. These improvements concern just as much the manufacturing apparatus as the composition of the cement. However, in spite of these efforts it has not been possible so far to improve the portland cements in such a way that they become equal in characteristic qualities to alumina cement.

Properties and Composition of Alumina Cement

As is well known, the alumina cement has the following advantages as compared to the best portland cement:

1. High initial strength (the compressive strength of electric fused alumina cement after 12 hours is more than 500 kg. per sq. cm.) (7112 lb. per sq. in.).
2. High resistance to chemical attacks (corrosive waters).
3. Hardening at temperatures below the freezing point.
4. Favorable setting time.
5. Absolute stability in volume.
5. Stability in storage.

*Abstract translated from a bulletin, "Elektroschmelzzement," published by Siemens and Halske AG., Wernerwerk, Berlin-Siemensstadt, Germany.

Translated by John H. D. Blanke

The raw materials from which the fused cement is made are principally bauxite and lime, which are used together in a certain proportion. In order to produce a completely uniform product, the electric fusion process comes in for consideration. For this purpose electric furnaces are employed which operate on the incandescent arc principle. A high output can be obtained with this equipment only by use of furnaces which can be operated continuously.

The chemical composition of alumina fused cement as compared with portland cement is about as follows:

Substance	Alumina cement, per cent.	Portland cement, per cent.
Al_2O_3	35-50	3 - 8
CaO	35-45	60-65
SiO_2	5 -10	20-25
Fe_2O_3	5 -15	0.5- 5

The portland cements are in general silicates; the alumina fused cements, on the other hand, are lime aluminates. The difference of the chemical composition of the portland and alumina cements is also shown in their moduli:

Cement	Moduli: Hydraulic	Silicate	Iron
Portland, about	2.00-2.20	2.00-2.20	1.50-2.50
Alumina, about	0.50-0.65	0.05-0.15	2.50-6.00

Which means:

Hydraulic modulus: $\frac{CaO}{SiO_2+Al_2O_3+Fe_2O_3}$

Silicate modulus: $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$

Iron modulus: $\frac{Al_2O_3}{Fe_2O_3}$

In per cent. figures

From this difference in composition of the cements results the differences in the qualities of the two kinds of cement.

The setting process is the same for both cements, but the hardening is different. As is well known, portland cement shows a very slowly increasing hardness, requiring several weeks until it has acquired its normal strength; whereas in the case of the alumina cement the greater portion of the hardening energy is liberated during and shortly after the setting, so that as early as 12 to 15 hours a strength of more than 500 kg. per sq. cm., as already mentioned, is attained by the standard mortar (1:3 normal sand).

The insensitivity of the alumina fused cement to chemical influences (corrosive waters) is traced back to the low lime content. A further advantage of the alumina fused cement is the notable increase in temperature during the setting, which permits concreting at temperatures below zero. Even

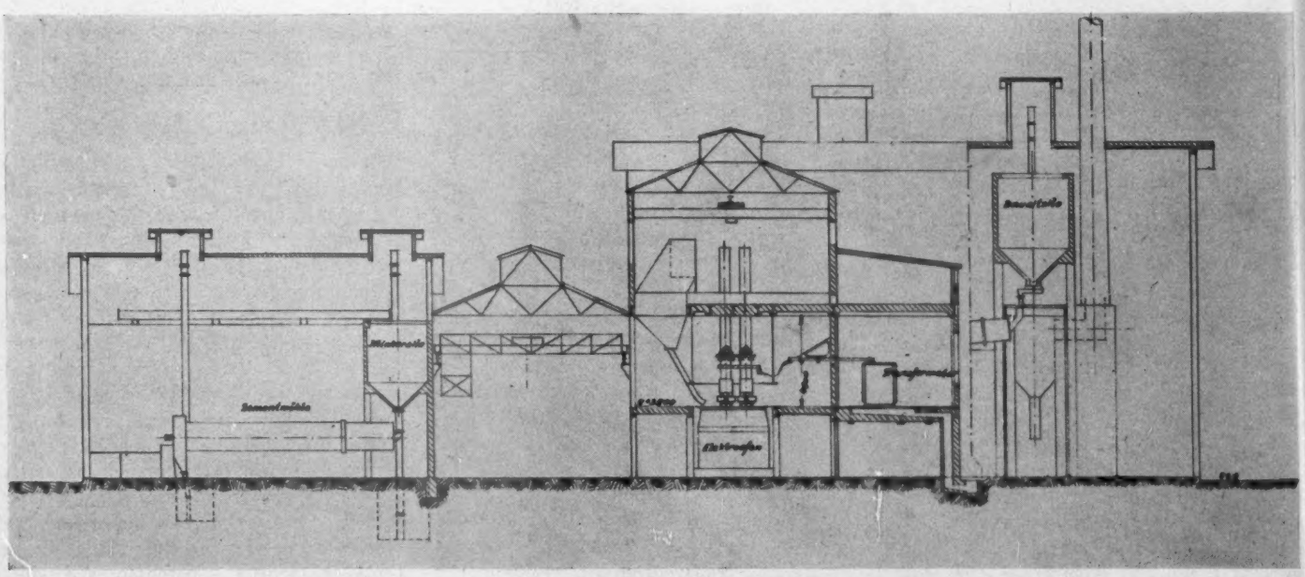


Fig. 1. Section through plant using electric furnace, with furnace in center

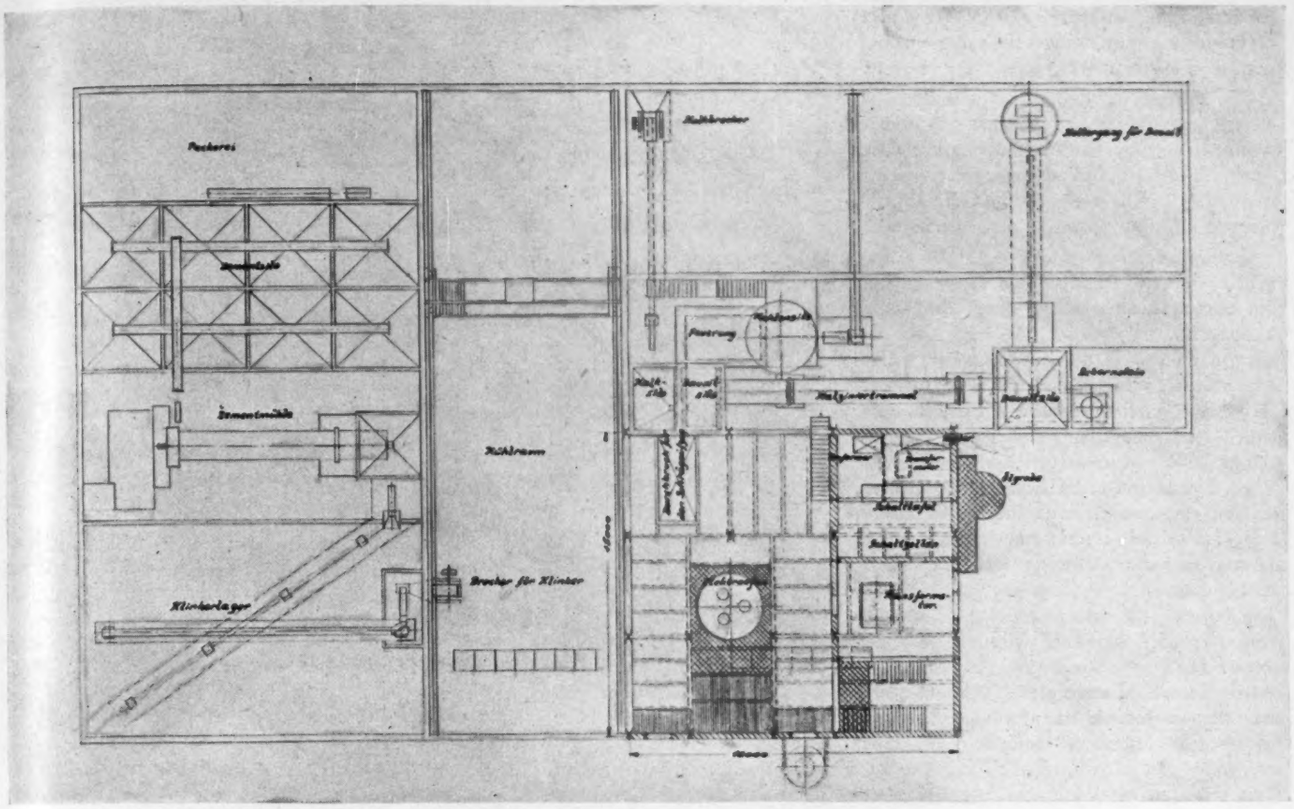


Fig. 2. Plan of plant using electric furnace for making high alumina cement

though the alumina fused cement dates only from the World War, it is today so well distributed that it is made in nearly all countries.

Electric Furnace for Producing Alumina Cement

In the following is described an electric furnace plant designed, delivered, installed and placed in operation by the Siemens and Halske Corp. for the firm Koenigshof Zementfabrik at Tschischkowitz. Figs. 1 and 2 show the general design of the plant. The raw materials—bauxite and burned lime—are crushed and delivered to separate silos by means of belt conveyors and bucket elevators. The crushed bauxite passes from the silo to the calcining drum, in which it is heated to about 800 deg. C. (1472 deg. F.). The water contained in the bauxite is removed in this manner so that the electric furnace performs only the work of fusing. The bauxite passes from the calcining drum into the finish silo, which is located next to the lime silo. The discharges of both silos are located above the weighing and proportioning equipment by aid of which the required raw mix can be prepared. The mixed material then enters into a pan conveyor, and by means of an inclined elevator is fed to the charging or furnace bunker, and from here by way of a table feeder and movable down spout into the furnace.

The equipment is so designed that the hot bauxite is stored in a well heat-insulated bunker, and the raw materials mix enters into the furnace in a warm condition. Fig. 3 shows a section through the furnace, which has been especially designed for the production of fused material. The furnace is arranged for operation with alternating three-phase electric current and is provided with three round carbon electrodes arranged in a triangular position. A special lining serves to protect the floor, and a water-cooling system serves to protect the side walls.

In the design of the furnace, consideration was given at all points to the special qualities of the fused cement bath; since the fusion point of the four materials mix (alumina—lime—ferric oxide—silicic acid) is comparatively low (about 1400 deg. C. or 2552 deg. F.), an overheating of the bath must be avoided absolutely in order to avoid unpleasant auxiliary reactions and evaporation losses; this is effected by an ample cross section of the electrodes and correspondingly low current density at comparatively high arc tension, by a large bath surface and by "covered fusing" which can be carried through very well by means of a double casing furnace (German patent applied for). The radiation and heat conduction losses have been confined to a minimum in the new type of furnace, so that the exceptionally favorable energy consumption of 800 kw. hr. per ton of cement clinker and an electrode consumption of only 8 kg. (19.4 lb.) per ton can be attained.

In the above case the furnace was designed as a portable unit, but it can be built in place. The furnace is provided with two draw openings, of which one serves for drawing the fused cement, whereas the second one can be used for drawing off the iron which is eventually reduced. The winning of iron as a byproduct comes into consideration when a bauxite high in lime content is to be worked, or when the production of cements low in iron is demanded.

From the drawing (Fig. 3) and the views (Figs. 4, 5 and 6), it is apparent how the carbon electrodes have been arranged and built up for uninterrupted operation. The electrodes of a diameter of 500 mm. (20 in.) are assembled of individual 2 to 3 m. (6.6 to 9.8 ft.) long electrode carbons by means of conical nipples and held by sliding fittings which are provided with water cooling. Such a slide fitting with mechanical pressure consists of water-cooled jaws of special casting, which are held together by means of water-cooled rings of cast steel. Pressure screws, which pass through the cast-steel ring, are provided for pressing the jaws together. The fitting is suspended from the jaws. The jaws themselves are fastened by means of joints to a supporting cylinder. The entire construction hangs in the electrode supporting frame on four chains which lead to a winch.

The suspension arrangements of all three electrodes are carried in the upper service platform, where the electrodes are connected, by means of a ceiling structure on which all necessary guiding and reversing pulleys are provided. This ceiling structure, including the ends of the three electrodes, is visible in

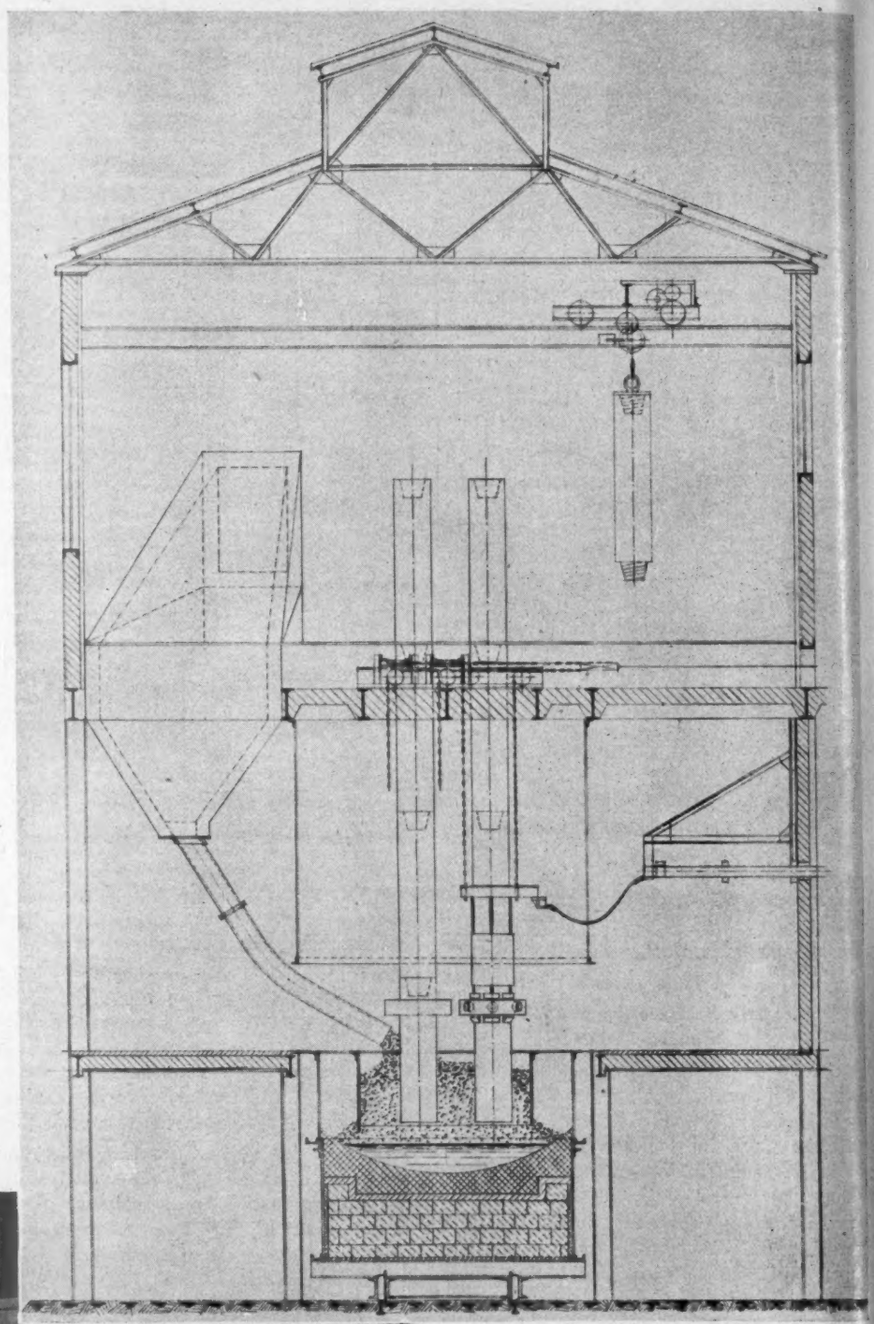
the background of Fig. 4. In the front part of the picture may be seen the cable winches with their motor drives.

The shifting of the electrodes is done by electric motors either by means of an adjusting pulley by hand or automatically by cutting in a special electrode regulator. This regulating arrangement permits an adjustment at any time to the kiln output desired.

Water-cooled copper tubes are used in the field of the hot furnace zone for supplying the current, which at the same time serve as conduits for the cooling water for the electric mountings. Flexible copper bands are attached to the water-cooled tubes; these are connected to stationary copper bars which lead from the transformer. Fig. 6 shows the arrangement of these supply lines. The joint between the transformer clamps and the stationary bars is effected by insertion of a flexible intermediate piece, so that damage to the transformer from expansion of the copper bars is avoided; see Fig. 7. The bundles (of triangular shape) of stationary copper bars and also the flexible copper bands are so arranged that due to the reciprocal influence of the fields the self induction is reduced to a minimum. The arrangement described here has given a cost of 0.92.

In order to carry off the dust and generated gases, a discharge hood is provided, which is connected with a powerful fan. The gas discharge hood is so effective that the furnace room is completely rid of the obnoxious gases and dust, especially the lime dust.

As already mentioned, this plant operates with continuous carbon electrodes within sliding mountings, such as supplied by the Siemens-Plania Works Corp. for Carbon Products of Berlin-Lichtenberg. The advantages of this mounting and of these electrodes, as compared to the packet electrodes with head mounting which have been



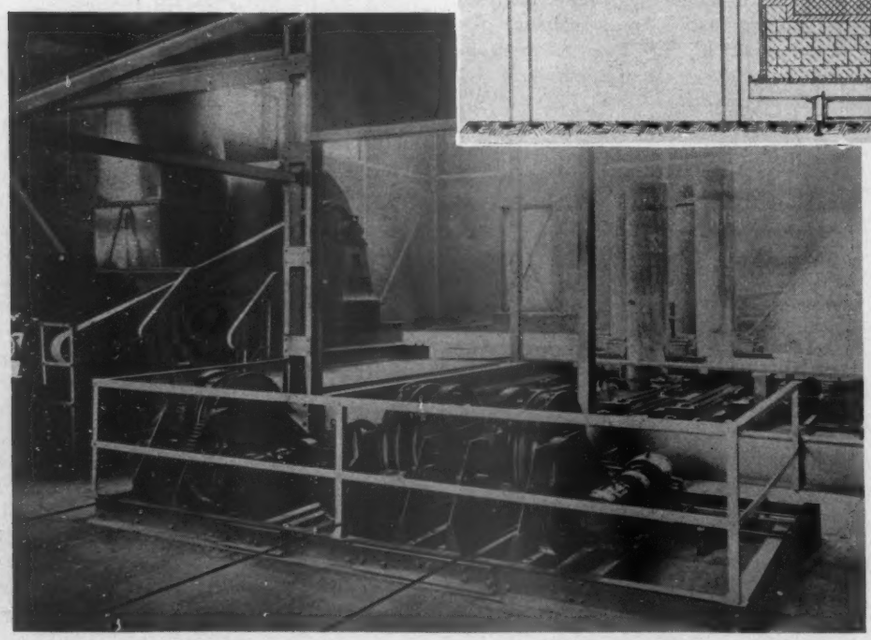


Fig. 3 (above). Section through furnace. Fig. 4 (left). Cable winches and motor drives, with upper ends of electrodes in background

used so far, is first of all that the furnace can be operated without interruption, since no replacement of the electrodes is necessary. The connecting of the electrodes causes no interruption in operation. A further advantage of this electrode is the elimination of the remainder of the electrodes, together with the economic consumption of the electrodes and also the low heat and energy losses. The energy losses are low because in the continuously effective electrodes the sliding mounting grips deep and therefore the current carrying portion of the electrode can be smaller than in the case

TABLE OF THE PROPERTIES OF ELECTRICALLY FUSED ALUMINA CEMENT

Fuse No.	Screen 4900	Period of set		Storage in water: 12 hours		18 hours		1 day		2 days		7 days		28 days		Increase	Analyses: SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO
		Start	End	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.						
141-143	3.8%	3.40	5.15	30.2	530	30.5	531	28.5	551	31.7	592	35.0	625	35.8	705	0.64	4.86	40.92	20.54	34.41	....
144-146	3.6%	1.100	4.10	29.3	514	27.7	489	27.7	521	32.8	559	30.0	633	35.8	676	1.10	5.09	40.48	20.81	35.10	....
147-149	3.8%	1.15	3.15	28.5	498	27.0	455	28.1	512	35.1	537	34.8	641	39.3	710	0.93	4.50	39.05	20.59	36.83	....
150-152	3.8%	4.15	5.45	28.0	529	29.2	537	33.0	589	34.1	551	34.6	651	38.8	663	0.94	4.35	41.12	20.66	34.56	....
153-155	3.8%	2.10	4.25	25.6	523	29.2	535	32.2	495	33.3	501	33.3	649	39.7	714	0.61	4.68	39.63	20.45	35.96	....
156-158	3.2%	1.00	2.15	28.2	542	31.0	508	31.5	546	30.0	538	36.8	655	39.5	664	0.45	4.48	40.33	20.23	35.41	....
159-161	3.7%	1.00	3.10	29.6	529	31.7	533	34.5	470	34.0	599	31.6	693	35.5	759	0.26	4.37	39.55	19.65	36.88	....
162-164	3.9%	2.00	3.15	30.5	540	28.7	548	30.0	535	32.8	574	32.7	649 36.5*	33.0	740 789*	0.47	4.60	40.32	19.70	36.24	....
165-167	3.5%	1.00	3.00	27.2	506	29.0	538	32.1	558	33.2	589	42.7	705	35.5	744	0.41	4.90	39.89	18.84	36.83	....
168-170	3.6%	0.50	3.05	25.7	541	30.2	537	30.8	577	33.7	594	38.2	693	31.5	742	0.33	4.68	40.06	19.87	35.97	....
171-173	3.9%	1.00	3.20	30.5	543	30.8	568	29.7	551	32.0	628	40.2	732	34.7	767	0.39	4.79	40.54	19.18	36.13	....
174-176	3.8%	1.20	3.40	24.5	537	30.1	512	34.8	580	34.6	625	36.0	666 36.2*	35.5	773	0.41	4.67	40.80	18.64	36.34	....
177-179	3.8%	6.15	7.35	28.0	503	29.0	559	32.2	564	34.3	588	31.5	690	35.6	777	0.43	4.91	41.21	18.69	36.20	....

*Combined storage.

of the head mounting. It may be mentioned here also that when using the continuous electrodes, an interruption in production is avoided due to the above-mentioned advantages, because of which the economy of the plant is increased.

Fig. 8 shows the lower portion of the furnace with the discharge for the liquid cement, and also the electrically driven mold cars; about 20 cast-iron, thick-walled molds are placed upon these cars, into which the liquid cement is drawn. Each mold has a capacity of about 275 to 325 kg. After drawing is finished, the cars are pushed into a cooling room where upon solidifying of the contents the molds are raised by means of a crane, one at a time, and dumped. The individual solid blocks of the solidified cement are stored and from storage supplied to a crusher according to demand, and then processed further as is customary with cement clinker.

Clinker of Extreme Hardness

In order to grind the fused cement, a specially strong design of mill is required, since the fused alumina cement clinker shows a greater hardness than the portland cements. It is therefore desirable to grind the fused cement clinker to a higher rate of fineness (from 2 to 3% residue upon the 4900-mesh screen). Normally the furnace operates continuously; but it can be operated periodically, depending on the power conditions of the plant. Every two to three hours about four to six metric tons of cement are drawn. At a load of about 2000 kw. (the transformer is designed for 2500 kv.a. output) the production per day is about 60 metric tons of aluminum fused cement.

The plant described here is provided with up-to-date equipment for the preparation and delivery of the raw material and also for the conveying and further processing of the cement clinker. Besides the superintendent who supervises the entire plant, the operation of the furnace itself requires only two men per shift. The profitableness of the plant is determined first of all by the cost of the raw materials (bauxite and burned lime) and also by the cost of the electric energy. In districts where either electric power or the raw materials can be obtained at a low price, the production costs for alumina fused cement can be decreased so far that they reach those of the high grade portland cement. Under certain conditions the production costs can become even more favorable, namely, in countries which have abundant deposits of bauxite and

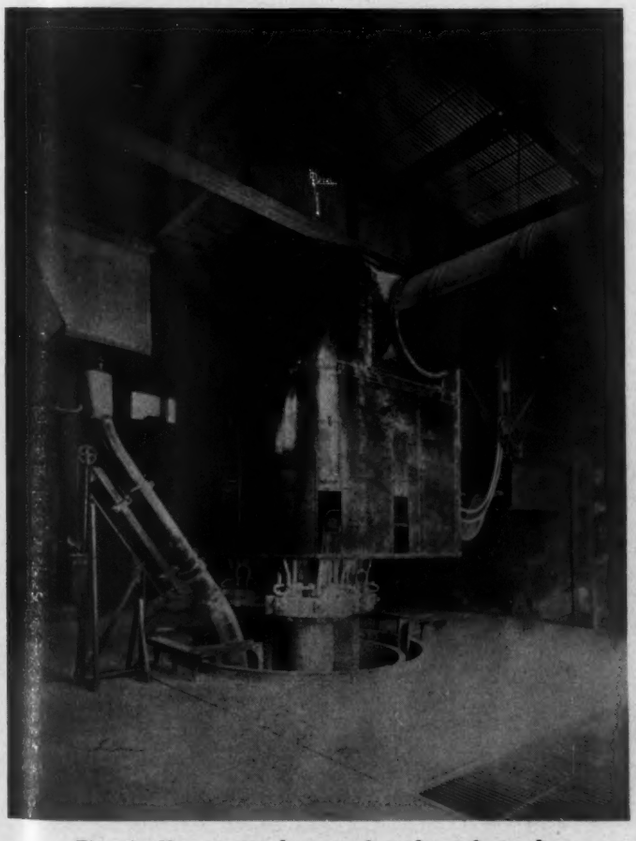


Fig. 5. Upper attachment of carbon electrodes

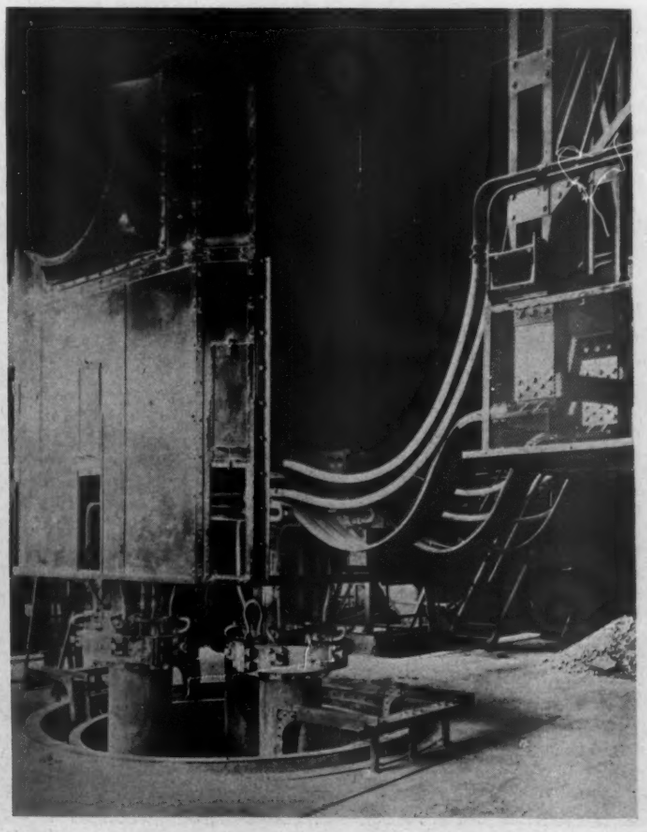


Fig. 6. Arrangement of supply lines

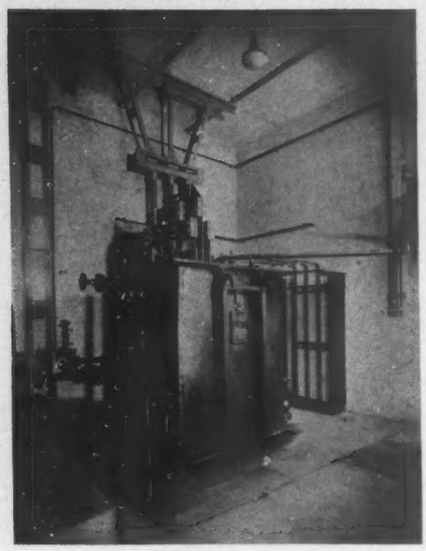


Fig. 7. Connection to transformer

abundant hydro-electric power, but can obtain coal only at higher prices.

The following data may serve for establishing a calculation for profitableness of the plant; per metric ton of alumina fused cement is required:

0.7 to 0.8 metric ton of bauxite (according to composition);
0.4 to 0.45 metric ton of burned lime (according to composition);
700 to 800 kw. hr. per ton (depending on quality of raw materials);
7 to 8 kg. of carbon electrodes.

Upon the basis of these data the material and energy costs may be figured according to local conditions by employing the local prices. To this must be added the cost of wages, repairs, the power costs of the grinding plant and auxiliaries, and also the costs of packing in paper sacks, of depreciation of the plant and of interest charges.

The plant described here is an example of a new field of application for electric power and for the large bauxite deposits still little utilized in many countries. In the erection of further plants, especially those with larger furnace units, still better fusing results and correspondingly greater economy of the electric fusing process for the production of fused cement can be obtained.

Cement or Brick?

(An editorial in the *Chicago Tribune*)

THE STATE DEPARTMENT of public works (Illinois) has received bids for resurfacing and widening with brick 76 miles of old concrete roads. The opening of the bids was accompanied by a renewal of the controversy between cement and brick manufacturers. The brickmakers and their allies, the bricklayers, say the cement interests are trying to hog the business, while the cement manufacturers reply that a brick pavement is relatively expensive.

It is unfortunate that in this controversy the motorist who pays for the roads and uses them is not given the determining voice. The representatives of labor and of manufacturers are entitled to a hearing and consideration, of course, but the state is not justified in disregarding the preferences of motorists or in paying more for road building than is necessary.

Hearing on Cement Tariff Again Postponed

THE United States Tariff Commission has announced that the hearing in connection with the commission's investigation of the tariff on Roman, portland and other hydraulic cement or clinker, scheduled to be held April 14, 1931, has been postponed to June 10, 1931.

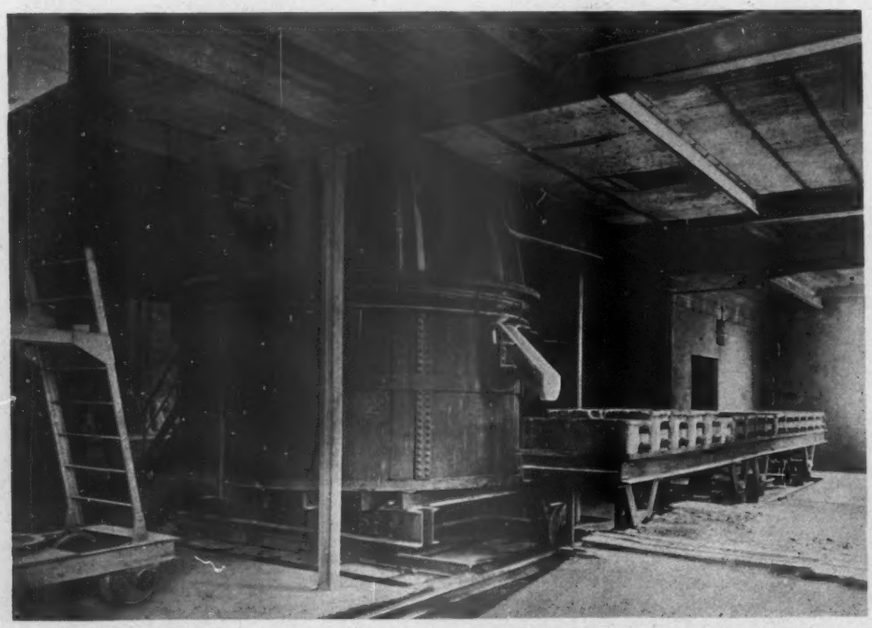


Fig. 8. Lower part of furnace with discharge for liquid cement

Cement Committee A. S. T. M. Would Employ Technical Expert

AT A MEETING in New York City on February 6, Committee C-1 on Cement of the American Society for Testing Materials took another forward step in improving its efficiency of operation and its service to cement users. While the committee is a large one and composed of representatives of nearly all important technical groups who use or make portland cement, the committee recognizes that this material is so widely used and its uses are so diversified that it is almost impossible to keep in touch with the views and experiences of cement users through its membership. The committee therefore has suggested to the society for approval the plan of employing a technical assistant to the chairman of the committee, whose duty, among others, would be to keep in touch with developments in cement and concrete in the different fields of its use.

Through its long history as a specification-making committee, the committee on cement has developed and improved from time to time numerous methods of tests for cement. More recently it has established, through a fellowship arrangement of the U. S. Department of Commerce, the Cement Reference Laboratory, which is located at the National Bureau of Standards, Washington, D. C. The reference laboratory is available to all who desire to use it as a means of checking the methods of making tests on cement, the apparatus used in making the tests, and the technique of laboratory practice.

There has been found a considerably increased interest in the questions of what should be the requisite properties for masonry cements and what methods of tests should be employed for such materials. These questions are now being actively studied by the committee and there should soon be sufficient data available to enable the committee to offer a specification.

Highway Construction Contracts Far Above 1930

EMERGENCY RELIEF MEASURES of the federal government, as applied through the field of construction, are now bearing definite benefit to industry and employment and give promise of resulting in a banner year for highway and public works activity, members of the new executive cabinet of the Associated General Contractors of America declared at the opening of their first meeting in Washington, D. C., recently.

Pointing out that the contract awards for highway construction during the first two months of this year were 70% greater than for the corresponding months in 1930 and larger than for any corresponding period on record, A. P. Greensfelder, president of the association, stated that this activity is only a prelude to that which is to come.

Lime Production Methods of Europe and America

Part III—In Which Is Given a Genealogy of the Earth and Some Data on the Origin of Limestones

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

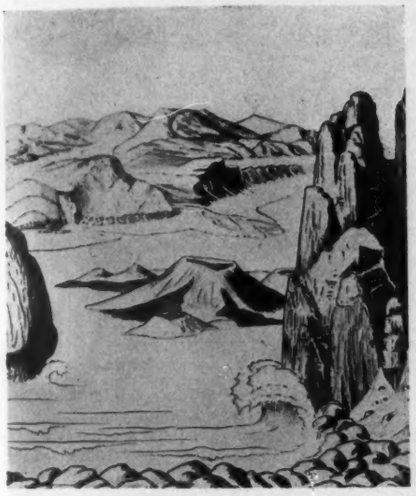


Fig. 40. Earth's surface during period of solidification

THE state of the lime industry, as well as the deplorable state of the art of lime burning, makes it appear that the lime men —a good portion of them, anyway—suffer from an "inferiority complex." In other words, they probably feel more like the quarrymen of a common rock than the manufacturers of the world's most useful chemical.

To many of the producers, and I may also say consumers, limestone is just a stone which after being heated can be sold for more than is possible when in its raw state, instead of the most interesting substance in the mineral world. Limestone is not just a rock, like granite, for example. While the lime may have been born as part of such a rock from the earth's igneous fluid, the liquid magma of long, long ago, it has been subjected to many chemical and physical reactions since then. It has traveled long distances and through many stages of evolution, until verily it entered life and was deposited millions of years ago on some great lake or ocean bottom by the shell-forming invertebrates in beds of tremendous thickness.

Lime entered the life cycle of the earth so importantly that if it were not for lime, you and I, if living, would be some helpless jellyfish floating in an ocean, or some lowly, squirming soft worm. It is not only that we use lime to build our homes, but we use it to build our skeletons; and we use it in industry in a thousand different ways.

Editor's Note

***IN THIS INSTALLMENT** our author waxes poetic in the eulogy of lime and limestone. Like many another intelligent investigator of lime and the lime industry, he is tremendously impressed with the vast importance of lime to "life, liberty and the pursuit of happiness."*

While this time the title of the article is somewhat misleading, we are glad, and we are sure our readers will be glad, that Mr. Azbe has utilized the space assigned to him to do a little romancing with our genealogy and to tell so interestingly the natural history of lime and the part it has played in the evolution of life on this planet of ours.

He has demonstrated quite convincingly, as well as interestingly, that no two limestones are identical, and why; he has emphasized the idea of specialty in lime manufacture; and we hope he has done much to remove the "inferiority complex" of present-day lime manufacturers.

In all of these endeavors we are in hearty sympathy with him; and we hope the reader derives as much sheer enjoyment and instruction from the article as did the editor.

How Lime Was Formed

After this somewhat romantic introduction it may be well to get into details to a slight degree. Once upon a time, as one theory has it, our earth was so extremely hot that everything on it was dissociated into its elements, which were all present in gaseous form. Water then was nonexistent, neither were there any mineral substances that now make up most of the weight of our globe. The whole was a gaseous ball at a temperature of the electric arc or higher, at which temperature no solid or even liquid substances could exist. However, hydrogen and oxygen, carbon and calcium, alumina and silica, magnesia and the others of the 92 elements were then as much present as they are today.

The heat-generating capacity of the earth was lowered after ages upon ages of time. With much of the energy lost, the turbulency of the atoms was reduced, and the sphere of their activity lessened. During the cooler gaseous state the atoms approached closer and began to influence each other more and more until they started to form a great variety of combinations. Thus various compounds were formed, as calcium oxide, for example. Then, as the earth cooled still further, a selective liquefaction took place, then solidification (crystallization) began, with those substances having the highest fusing points solidifying first, followed by most of the others.

As Fig. 40, a picture in the German Museum, attempts to show, at the end of this period the size of our earth was probably

Fig. 41. Formation of limestone beds in the Devonian period

TIME TABLE OF THE DEVELOPMENT OF THE WORLD

Arranged and compiled from various sources by Victor J. Azbe

Time & duration Millions of years	Era	Period	Epoch	Physical Events Deposits and formations	Life Animal and plant	Age
	Azoic Lifeless			Formation of earth as per planetismal or nebular theory. Atmosphere, ocean, continents form.	No life.	
750 (200)	Archeozoic	Keewatin		Igneous rocks predominate. Mountain making — Laurentian Mountains. Great volcanic activity. Sedimentary deposits forming.	Very primitive animalculae and green scum. Evolution of crustacea.	
		Laurentian				
550 (100)	Proterozoic	Huronian		Oldest known formations, Ontario silver, Lake Superior copper and iron, sedimentary deposits forming.	Life scanty. Lime forming algae. Invertebrates very primitive. Soft worms and sponges—few fossils. Beginnings of evolution of Brachiopoda.	
450 (175)		Keweenawan				
275 (35)	Paleozoic Ancient life	Cambrian		Earliest lime deposits.	On land, lifeless bare rock. All life in seas. Marine invertebrates plentiful. Crustacea—lime shell-forming invertebrata. First marine plants.	Age of invertebrata
240 (45)		Ordovician		60% of North America submerged. Great lime deposits, lead and zinc. Ohio, Indiana petroleum and gas.	Marine shell life as mussels abundant. Bug-like marine crustacea Trilobites. Trace of insect life—evolution of vertebrata.	
195 (20)		Silurian		Great limestone beds deposited, iron ores, salt.	Maximum of shell life—sea rock lilies (crinoids). Giant crustacea (scorpions). First air-breathing land animals. Vertebrata ancestral to fish.	
175 (25)		Devonian		Limestone deposits. Pennsylvania petroleum and natural gas.	Shell fish still abundant. Evolution of the age of fishes. Beginnings of amphibian and land plant life.	Age of fishes
150 (25)		Carboniferous	Mississippian	Indiana limestone.	Corals, maximum of stone lilies (crinoids). Sharks—first amphibian skeletons.	Age of amphibians and acrogens
125 (18)			Pennsylvanian (Coal measures)	Beginning of mountains. Coal forming Greatest known coal beds.	Vast swamp forests First reptiles. Primitive insects. Apex of amphibian life. Giant club masses and plants of horse tail and fern type.	
107 (12)			Permian	Mountain making—Emergence of continents. Greatest glacial period. Anthracite coal	Reptiles developing and marine invertebrata diminishing. Some paleozoic life becoming extinct.	
95 (20)	Mesozoic Middle life	Triassic		Aridity and formation of salt, gypsum beds, red sandstone, marine and land deposits.	Dinosaurus type developing. First mammals—first land trees. Palm-like plants—complex shellfish Nautilus).	Age of reptiles and chalk
75 (15)		Jurassic		Vast volcanic eruptions, rise of Sierra Nevada. Some coal, marine and land deposits.	Largest land animals—100 ft. long. Dinosaurus type as brontosaurus. Tyranosaurus—diplodocus. Flying reptiles—first birds.	
60 (33)		Cretaceous		Deformation of earth's crust, producing continents, ocean basins, plateaus, mountains — chalk.	Specialization and extinction of great reptiles. Rise of modern trees and flowering plants.	
27 (10)	Cenozoic Recent life	Tertiary	Eocene	Great changes in physical geography. Numulitic limestone of Egypt.	Appearance of modern mammals. The dawn horse Eohippus. Primitive primates.	Age of mammals
17 (7)			Oligocene		Rise of higher mammals. Rodents, dogs, anthropoid apes.	
10 (6)			Miocene		Mastodon, camels, horses, cats. Saber-toothed tiger—greatest development of higher mammals. Grassy plains.	
4 (3½)			Pliocene	Himalayas, Alps, Rockies, Andes made or remade. Other mountains in making.	Climax of development of mammals. Development of man-like types. Pythecanthropus erectus.	
½		Quaternary	Pleistocene	Widespread glaciation. Erosion of Grand Canyon.	Appearance and rise of man. Struggle with powerful animals. Piltdown—Heidelberg—Neanderthal man.	Age of man
				Recession of European ice sheet.	Old and new stone age—use of fire.	
			Recent	Erosion of continents.	The development of the culture of man.	

Rise and development of higher order of plants

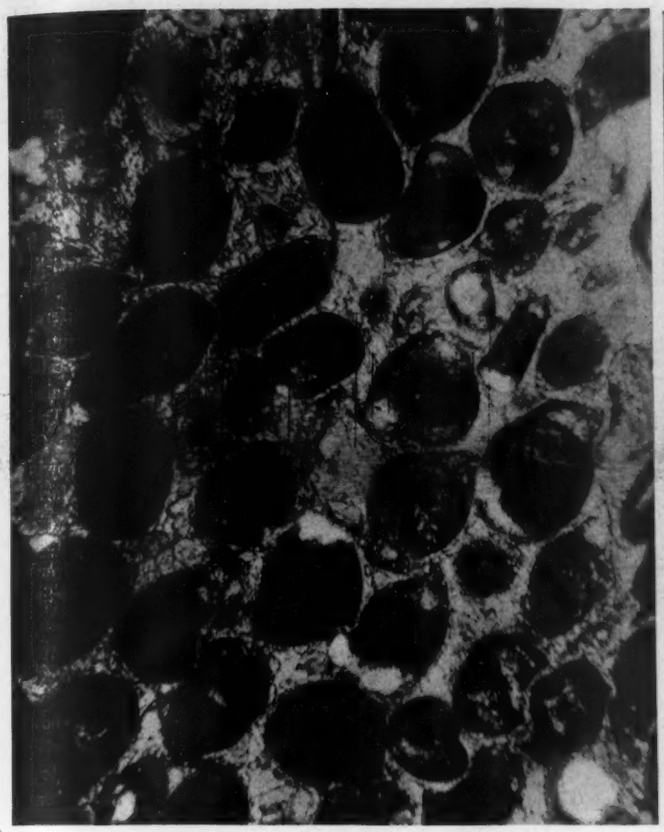


Fig. 42. Natural cementation of lime particles

Fig. 44. Fossiliferous rocks

much as it is today, except that the surface was mostly all igneous, granitoidal rock, made up of silica, mica, feldspars, etc., with some of them containing calcium in combination. Active volcanoes were plentiful and the earth's shell was probably often replaced by new effusions. The atmosphere was hot and heavily charged with water vapor. There were no petroleum, coal or limestone deposits, so probably most of the carbon was in the air in the form of carbon dioxide. When it rained, and it is presumed at this period that it rained much of the time, the rain was a mild acid and attacked the stone formations, disintegrating them into new combinations. The component lime compounds combined with the carbon dioxide in the rain-water to form the soluble calcium bicarbonate $Ca(HCO_3)_2$, and in this soluble form the lime could readily travel towards the oceans.

Almost all streams today carry lime, as the original streams did hundreds of millions of years ago, but since the amount of calcium bicarbonate capable of remaining in solution depends on the concentration of the gas CO_2, also in solution, which, in turn, is dependent upon temperature pressure and concentration of CO_2 in the atmosphere surrounding the solution, it is practically certain that a stream or ocean in those ages was capable of carrying much higher lime concentration than those of today.

With bicarbonate of lime present in the waters of the earth, the important process of formation of carbonate of lime could begin. It was for this period that all but the most primitive life had to wait, as is shown by the appended "Time Table of World Development"; and the great limestone beds of today are mostly cemeteries of ancient life testifying that living matter then made good use of the lime. Fig. 41, another wall painting from the German Museum, illustrates the Devonian time, a comparatively late period in the scale of ancient life, and shows the formation of limestone beds by corals and other shell-forming life. Fish, during this period, can also be noted and can be considered as our early ancestors.

Fig. 43. Harmann's cave, containing 8000-year stalactite

Lime in Solution to Limestone

The lime in solution as a bicarbonate is converted into the carbonate of limestone deposits in several different manners as follows:

(1) By precipitation from solution caused by change in temperature. Any increase of temperature of a saturated solution of calcium bicarbonate will result in driving off some CO_2 from the bicarbonate, causing the remaining carbonate, which is insoluble, to precipitate. This very thing goes on in many a hot water heater, and the scale that forms, when of the carbonate and not sulphate variety, could be called a limestone bed. Most natural limestone beds were not, however, formed in this way, although this principle had much to do with cementation of the granular lime particles formed through other means. The cementing ground mass of Fig. 42 holding the oolitic portion together was probably formed in this way.

Fig. 45. Carboniferous period

(2) Calcium carbonate deposits were also formed by evaporation. Water bearing calcium bicarbonate would ooze out of a crevice in a rock cave. Part of the water would evaporate. This evaporation would increase the cementation to such an extent that there would be more bicarbonate than the water could maintain in solution. Precipitation would take place, CO_2 would escape and calcium carbonate remain, and—probably after thousands of years—would form a beautiful stalactite, which is a familiar sight to visitors of caves found the world over. Fig. 43 is a view of Hermann's Cave in the Harz, Germany. The main stalactite is called the 8000-year column, having required that long to form. This process of limestone formation is comparatively unimportant; in some cases, however, springs deliver large volumes of bicarbonate bearing waters, and at the mouths, pressure is released, some CO_2 escapes and considerable quantities of carbonate called travertine are deposited.

(3) Since solubility of calcium bicarbonate depends upon the CO_2 gas concentration in solution, if the solution is saturated, any absorption of this gas by any means, will upset the equilibrium and an amount of carbonate is precipitated. Algae and other water plants require CO_2 for growth, only instead of absorbing it from the air, as ordinary plants do, being submerged they have to absorb it from the water, and so may cause concentration to the very edge of precipitation, when the slightest change in temperature deposits calcium carbonate.

(4) Even bacteria enter as factors and denitrifying bacteria living in warmer portions of the sea effect reduction of nitrates in the water to ammonia, which, with carbon dioxide produced by other bacteria, forms ammonium carbonate. This reacts with calcium sulphate, or gypsum ($CaSO_4$), in the sea water and the result is formation of $CaCO_3$, $CaSO_4 + (NH_4)_2CO_3 = CaCO_3 + (NH_4)_2SO_4$. The calcium carbonate separates out and is deposited on various minute floating nuclei to form small spherical grains which, in great masses, became our oolitic limestone deposits. Fig. 42 is a photograph of Ste. Genevieve oolitic limestone taken with the aid of a microscope. The magnification is 40 diameters or 1600 times in area. One can see the original nuclei, the oolitic secondary growth and the crystalline cementing groundwork.

(5) Most limestone beds are, however, deposits of shells, much on the order of oyster beds of today. The first deposits of importance took place in the Cambrian period, and the most during the following Ordovician and Silurian periods, when 60% of present North America was an ocean bed. At first, the shells were primitive in nature, but nature experimented and attempted to evolve something better and from single shells of the simplest kind evolved those double joined by a hinge and finally the very complex and beautiful nautilus. There were clam, snail, coral-like varieties numbering into thousands. Fig. 44 shows four very evidently fossiliferous rocks. In one the so common segments of crinoid stems predominate, the so-called stone lily, fixed plant-like but of animal nature. By referring to the Time Table of the Development of the World we find that most lime beds were formed following the Archean or lifeless age, Fig. 40, during the earlier part of Paleozoic era, Fig. 41, before the Carboniferous period when our most important coal beds were formed, Fig. 45, and long before the Mesozoic time or the age of Reptiles, Fig. 46.

Contamination and Metamorphosis of Limestone Beds

Most of the beds in forming were, however, more or less contaminated by other materials. They may have been close to a mud depositing stream, or where the storms caused the seas to wash sedimentary deposits from the shores, or the natural ocean streams brought fine matter from long distances, which gradually settled out; or there may have been great volcanic activity, the dust depositing upon the ocean surface and settling to its bottom. Many things could have happened and so today there are, comparatively speaking, not very many pure limestone deposits.

Eventually, some physical change took place and upon the bed of shell fish remains, other sediment was deposited. The deposit may have been of great thickness,

Fig. 46. The age of reptiles

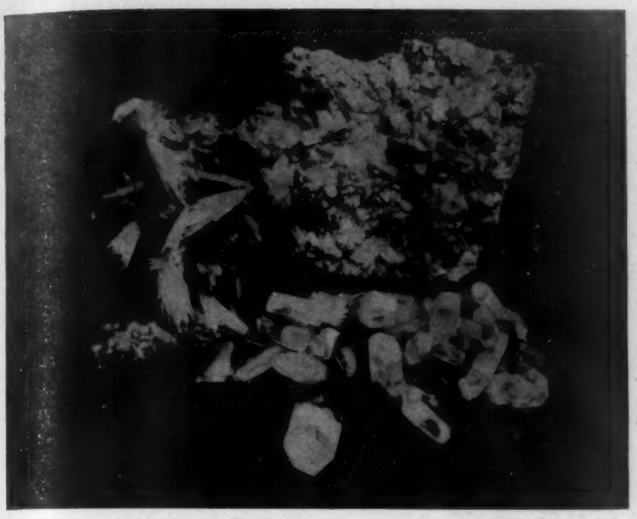


Fig. 47. Calcite, argonite and dolomite sprinkled with calcite crystals

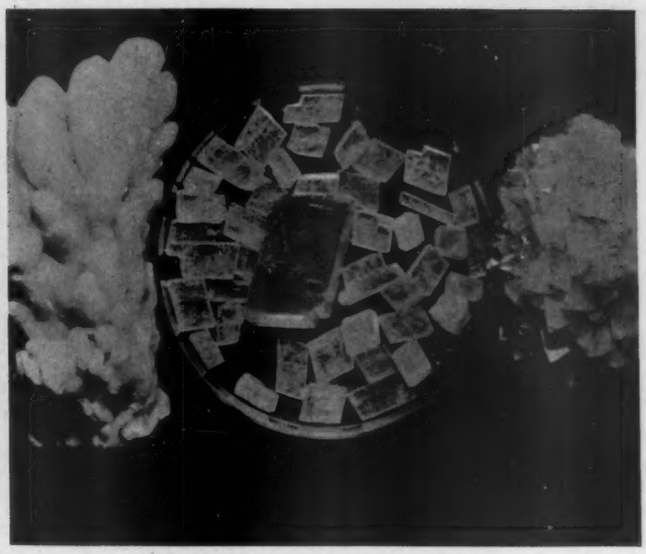


Fig. 48. Calcite in various forms

causing great pressure. Other pressure may have been exerted from below or from the side, causing the whole to emerge from the sea to possibly hundreds or thousands of feet above its original level. The deposit may also have been subjected to great heat and between this heat and the tremendous pressure an activity took place within these shell fragments, causing new arrangements. The unit cells of calcium carbonate located more or less at random aligned themselves into orderly crystals, some large, some small; the original form entirely disappeared and the deposit became a metamorphic limestone or marble.

Occasional dolomitization would take place, ordinarily of coral deposits which are of aragonitic rather than calcitic nature; the aragonite being less stable was more readily replaced than the other form (calcite) of calcium carbonate. The coral reef must have been submerged in magnesium rich marine waters for a long period of time, during which the less soluble magnesium replaced some of the calcium in the carbonate radical. Thus, the bed became dolomitized before it was elevated above sea level.

Fig. 47 shows coarsely crystalline calcite, lacelike aragonite, and dolomite sprinkled with calcite crystals. Fig. 48 shows stalactite, another arrangement of a calcite mass, loose small, and a larger rhombohedral crystal of calcite. Calcite crystals so large one man cannot lift them and so small no microscope can define them are known.

Fig. 49. Mineralogical Institute, Leipsig

Variety in Limestone Accounted For

So we have in our limestones, innumerable possible crystals and fossil arrangements, that probably were subjected to tremendous pressures or heat, or both, for variable lengths of time; which were acted upon by water having many things in solution and some in suspension. Those suspended impurities may have been comparatively coarse or extremely fine, and they may have been uniformly distributed in the limestone or localized.

Due to the above, we have limestones almost entirely made up of shells and others having no vestige of their original form; limestones having coarse crystals and others so finely grained as to be suitable for lithographic purposes; stone so firm as to

Figs. 50 and 51. Laboratories of Leipsig Mineralogical Institute

be used in terrazzo work and so crumbly that it can be burned only in rotary kilns; stone that is uniform and again other stone that appears to be a mixture of all; high calcium stone, dolomitic stone and stone that may have the analysis of dolomite but in which the calcium and magnesium carbonates form mixtures without a chemical bonds; stone which impurities make worthless and stone which impurities make more valuable.

All these differences more or less affect the burning. The stone may be firm but the lime crumbly, causing blockage of draft, non-uniform flame distribution in a lime kiln. A portion of a lump of stone may burn readily, others with difficulty. So the difference in the nature and amount, also distribution of impurities, the difference in crystalline and fossiliferous portions, the difference in density and firmness, the difference in replacement by magnesium, the difference in fracture as blocky or slabby, together with consequent difference in burning facility, may cause, under identical conditions, a final product, lime or hydrate, of quite different natures. Probably not much different for use as mortar, but for some chemical processes a product either excellent, mediocre or entirely useless.

Hence, the burning of limestone is not so simple as it may appear. In a limestone lump under heat extremely interesting and extremely complex changes take place, few of the gross visible nature, many microscopic and most sub-microscopic. Prof. Dr. Ing. F. Rinne of the Mineralogical Institute of Leipzig, Fig. 49, made a careful study of them. Fig. 50 presents one view of this Institute, while in Fig. 51 the x-ray department is shown where the ultimate structure of limestone is studied.

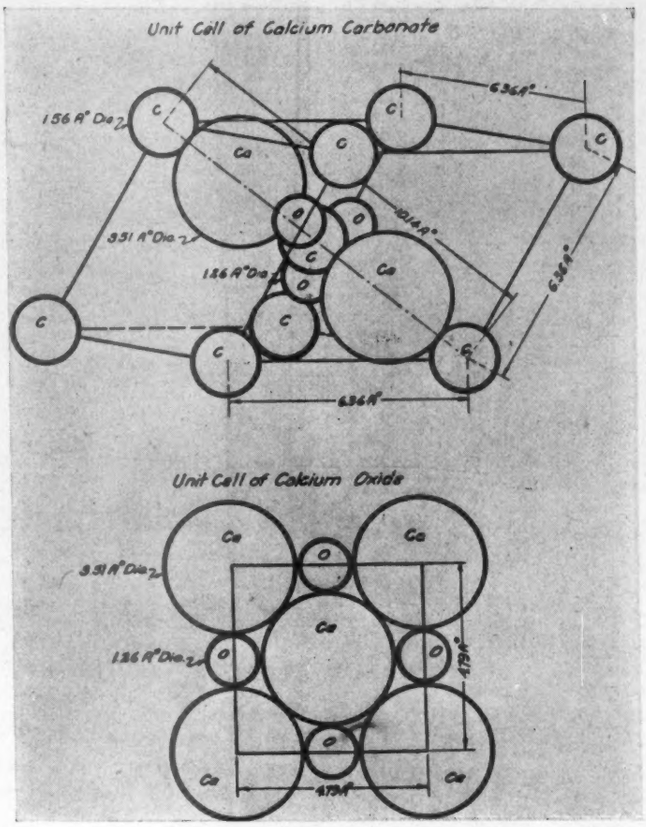


Fig. 52. Magnified unit cells of limestone

Physical Structure of Limestone

Previously, I repeatedly mentioned crystalline and fossiliferous limestones. Now in truth, if we magnify enough, all limestone and limes are made up of crystals but these crystals are so small that their structure and their arrangement cannot be revealed by ordinary light, not even by the short, ultra-violet rays; and only the ten thousand times shorter x-rays can photographically picture these crystals indirectly. For example, there may be two houses using identical bricks and still not be at all alike because the bricks are arranged differently. The same is true with lime. The atoms making up the molecules of lime or limestone are aggregated in a systematic manner so as to form unit cells. These cells are the smallest particles of lime or limestone that can exist. Fig. 52 shows them drawn to a scale magnified two quadrillion times. That these cells have this form, that they are of this relative size and uniformity of arrangement can be proven with great accurcy by the employment of x-rays, which is far more than just remarkable. The minuteness is so great that these unit cells in a cubic inch of limestone placed side by side would reach around the world about a million times; but in spite of that they are the governing factor of many lime properties.

Dr. Rinne has shown that limestone burns preferentially somewhat as ice forms on the windows, which he has shown in the micrograph, Fig. 53. Some zones are converted more readily than others; even when stone is uniform. When there is non-uniformity, as large and small crystals, or crystals and fossils, or non-uniformly disseminated impurities, the difference may become quite great, and although the stone is subjected

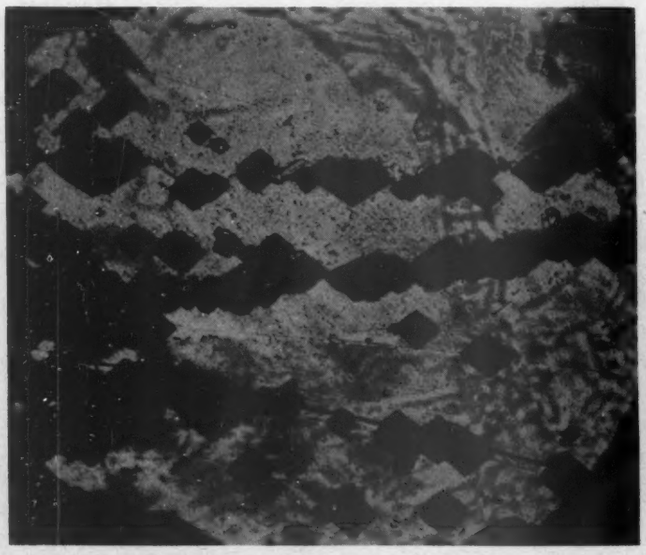


Fig. 53. Micrograph showing how limestone burns

Fig. 54. Ruins of the Acropolis from which the author secured a specimen of limestone

to far more than the theoretically required temperature some undecomposed carbonate may still remain.

Man in the Limestone Scale

The "Eonic Time Table of the World Development" revealed that most lime we use today was deposited 150,000,000 to 250,000,000 years ago, before any of the animals we know today existed; before any of our plants, even before our fuels were deposited. The coal bed forming period came much later, followed by the reptilian period and the development of trees and flowering plants. Then nature, after much experimentation, brought forth from the earlier life the mammals, the horse, the dog, the cat, the apes and at some point our apish human ancestors appeared, who gradually evolved into something more intelligent and more presentable, the "Homo Sapiens." So the lime deposits had to wait 200,000,000 years before man appeared and before man discovered their possible use and before he started wasting as we are wasting and misusing them today.

As man evolved to a stage when he was dissatisfied to live in dark, damp caves and started to build primitive dwellings he began to feel the need for cementing materials. No doubt it took him hundreds of years after becoming conscious of this need before he accidentally discovered that rock heated is made workable and then turns back to rock. At this point the development of the art of lime burning started. The Babylonians, 2500 years before the birth of Christ, then the Egyptians, used lime and used limestone. These two noble materials, however, never before, or since, have been applied to a more noble purpose than the building of the Grecian Acropolis at Athens. Pericles and Phidias here accomplished something that is an inspiration today 2300 years later, not only to builders but to all who have an appreciation of the beautiful. During the last European trip I visited the Acropolis, Fig. 54, for the second time and picked up a pebbly fragment of marble which, of my collection of mineralogical specimens, I now cherish more than any of the rich gold ore samples or even the one natural diamond crystal that I possess.

Fig. 55. The Chinese Wall

Fig. 56. Large chemical plant in Italy requiring special kinds of lime

Further down in the scale of time is the great Chinese wall, Fig. 55, taken from the admirable German Lime Association publication, "What the Builder Should Know About Lime Mortar." This wall has the great length of 1520 miles, is 54 ft. high with a width of 26 ft. at the base, 16½ ft. at the top. In the construction of this wall 400,000,000 cu. yd. of stone was used, which is 120 times the amount that was required for the Cheops pyramid in Egypt on which 100,000 people worked for 30 years. To us it is of particular interest that the stone of the Chinese wall was laid in lime mortar, and that the wall was built with penetrating canals so that air containing carbon dioxide could permeate it and thus harden the lime to stone, which proves remarkable knowledge for the time, 300 B. C.

Time for Little Pride in the Lime Business

In modern times lime has become an absolute essential in scores of industries, in the manufacture of glass and paper, sugar, leather, soap, soda, steel, rubber, ammonia, carbide and cyanamid, etc. For agricultural and construction uses, for water softening, in catalytic processes and distillation, coagulation, causticization, hydrolysis, dehydration, saponification, precipitation, neutralization, etc.; even in medicine.

Fig. 56 shows a monster plant in the valley of Lago Magiore, Italy, making carbide, cyanamid and ammonia, that would not be there if it were not for lime. For each of these processes a lime of particular characteristics is desirable. What these are is, in the majority of cases, only imperfectly known. Even less is known how to burn the lime so as to bring the desirable characteristics fully to the forefront, and one of the main reasons for this imperfect knowledge is that lime and limestone are considered common; and cheapness makes them common.

Lime is so essential to life itself—also often overlooked. In agriculture much more lime should be used, and in Europe much more is being used than here. The German Lime Association stimulates interest by many means, pamphlets, pictures, talks. As a result, the output per acre is much greater, in spite of the many centuries their soil has been used. Fig. 57 is one of the illustrations reproduced here for its interest. It represents the lime cycle; in the background is the sun, the source of all energy, while the figures and letters refer to:

(1) Lime deposits form in the ocean, then emerge as limestone mountains.
(2) Is a lime-burning plant.
(3) The lime is conveyed to the field and used as a soil fertilizer.
(4) Same leaches out with the ground water.
(5) Flows to the ocean, where it is again utilized as lime shell forming material.

In the inner cycle at (*a*) lime enters the growing plant; at (*b*) it is utilized by the grazing animal; at (*c*) the man gets the lime in the food either from the flesh of the animal or directly from the plant and at (*d*) the manure is returned to the soil; when it is returned, in modern life, most of it flows as sewage to the sea and makes

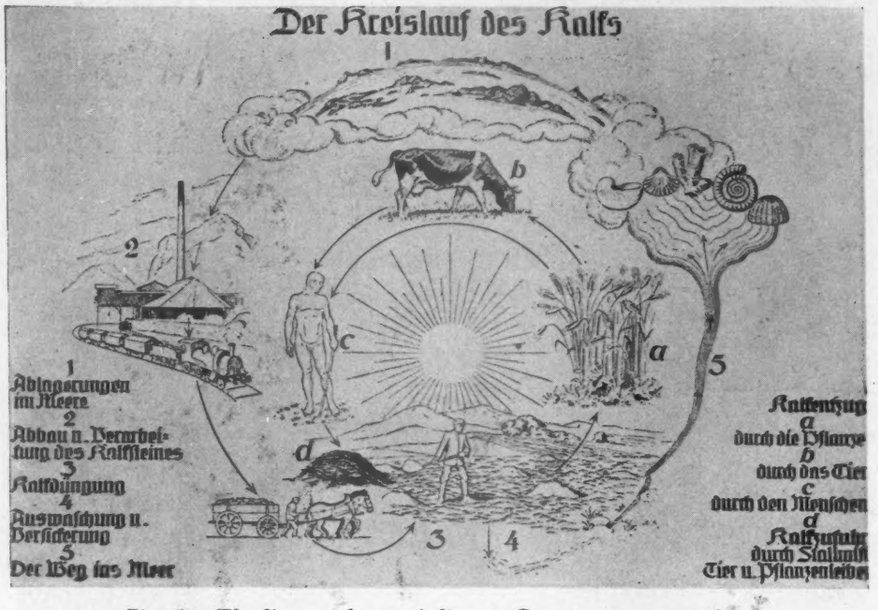


Fig. 57. The lime cycle, according to German representation

direct replenishment only more necessary.

With this, the third part of the series is ended and it is hoped that now the appreciation of the reader for this wonderful substance "LIME" is greater; and that he will be willing to follow me with a greater degree of interest as we continue to explore its uses and proper methods of its production. In closing I only want to say again that lime is considered common and cheap. Now while it is true that lime is cheap, it certainly is not common—it is one of God's greatest gifts to man.

(To be continued)

Idaho Lime Company Reported Ready to Build Plant

STOCKHOLDERS of the Sewell Lime Co. of Orofino, Idaho, held their second annual meeting in the company office recently and elected officers and directors for the ensuing year and heard the report of the secretary-treasurer on the first year's activities.

All officers and members of the board of directors elected at the organization meeting a year ago were continued for 1931 as follows: Dr. H. D. Britan, president; E. U. Falen, vice-president; J. M. Molloy, secretary-treasurer; Byron Sewell, assistant secretary-treasurer; C. O. Portfors, F. A. Jones and Theo. Blake, members of the board of directors.

The secretary's report shows the company to be in good condition and that many accomplishments were cited for the first year's operations, which thus far have been in the way of development mainly. According to his report, all necessary development work has been completed and the company is now ready to put up the first of three contemplated kilns for burning commercial lime for construction work. Work on the first kiln will start as soon as weather conditions permit and the other two will follow as soon as possible. The steel and part of the brick for the first kiln are already on the ground. Gravel for the mortar will come from a pit close by and all necessary equipment and tools for carrying on the work are at hand, including $600 worth of wire cable for getting the material to the kiln site.

Output of Three Kilns Already Contracted For

The three kilns will have a daily capacity of from 45 to 60 tons of burned lime and their entire output has already been contracted for by one company on the coast. This company, according to the report, was sent 10 bbl. of burned lime during the year as a test sample and following its receipt and use sent a representative here to look over the huge mountain of raw material situated 11 miles northeast of Orofino. The deposit was inspected and the contemplated output immediately contracted for, delivery to start as soon as the first kiln is completed. Besides, the report stated, this company promised to send a practical construction man here, who has been 18 years with the company, to supervise erection of the kilns.

Continuing, the report said that there have been four different people and concerns who have asked that a price be put on the property for an outright sale, but the officers felt that it was too valuable to let go and decided to hold on and operate themselves. Requests to contract the complete output of the Sewell company have come from various concerns. The report brought out that investigation has revealed the fact that the local freight rate which can be secured is as low as any offered to other northwest companies and a little better than some of them, so there will be no disadvantage from this standpoint.

Records of the company show that 35,000 of the 500,000 shares have been sold at 35 c. per share, and about 15,000 additional shares will be sold at this price, although there is considerable talk of raising it to 50 c. The sales brought in $12,250 and of this amount $10,095 has been spent for tangible assets, including buildings, furniture and fixtures, brick for kilns, sidetrack grading, lime barreling equipment, pump and engine, tools, test kiln, railroad steel and ties, lime production, pipe and steel for kilns, also other minor items.—*Orofino* (Idaho) *Tribune.*

A New Lime Product—"Liman"

THE Dixie Lime Products Co., of Ocala, Fla., is marketing a new lime product under the name of "Liman," a lime-manganese soil conditioner developed by Dr. F. T. Schreiber, consulting and analytical chemist of Ocala.

The inventors of this product claim that it is more profitable for the farmer to use hydrated lime, even if it does carry a higher initial cost, than to use ground limestone, for effective and quick results are obtained the first year and for four or five years thereafter, while with limestone only about 500 lb. per ton is effective the first year.

In addition they have discovered that if manganese in certain forms and amounts is incorporated with hydrate lime, a soil conditioner results that has very beneficial results on most soils. The product is not a fertilizer but a soil conditioner and acts on the plant by promoting the formation of the chlorophyl (the green coloring matter of the leaf), thereby increasing the action of the sunlight in the formation of the plant juices. This in turn enables the plant to grow more vigorously and to assimilate more readily the other necessary plant foods.

Manganese Added to Lime

These findings are the result of advances in the science of agricultural chemistry which have demonstrated that the presence of some minor elements, even in small amounts, has a decided influence on the productivity of the plant. Manganese has proven, according to the discoverers, to have a decided influence on the productivity of the plant.

Not all soils are adapted to or need this form of conditioner, hence the Dixie Lime Products Co. has established a soil testing laboratory at Ocala and invites the submission of soil problems to them for trial and testing before recommending that Liman be used.

The product is patented by Dr. Schreiber and so far is being manufactured at Ocala only. Dr. Schreiber's address is Ocala Heights, Ocala, Fla.

Gypsum and Gypsum Products Manufacture—Part IX

The Manufacture of Keene's Cement

By S. G. McAnally

Chief Chemist, Giant Portland Cement Co., Egypt, Penn.; formerly Chemist for the Pacific Portland Cement Co., Mound House, Nev., and Chemist and Superintendent for the Standard Gypsum Co., Ludwig, Nev.

HARD FINISH gypsum plasters are produced by calcining gypsum to a temperature of between 600 and 1300 deg. F. Of these plasters, Keene's cement is the best known and, probably, the only one manufactured in this country.

The original method of manufacturing Keene's cement was to calcine the lump gypsum to a dull red heat, treat the calcine with a 10% solution of alum and re-calcine to the same degree. The burned material was ground to a very fine powder.

The modern method is to calcine the raw to the necessary temperature (only one calcination being made), and then mix the finely ground calcine with certain chemicals. Various types of stationary kilns are used for burning Keene's cement, and one producer uses rotary kilns. The ordinary kettle used for calcining single- and double-boil stucco is not practical for making Keene's cement on account of the high calcining temperature necessary; about 700 deg. F. is required when the raw material is pulverized. However, the writer believes that the difficulties encountered when using kettles for calcining Keene's cement will be overcome eventually.

A type of kiln used for the burning is shown in Fig. 9. The kiln is about 20 ft. in diameter and 12 or 15 ft. high. The fire-boxes, usually six in number, are located equidistant from each other around the perimeter. In the center of the kiln floor there is an iron grating that connects with the flue which leads to the base of the stack. The fire-boxes are so constructed that the hot gases have to ascend to the roof and are then drawn downwards to the grating and thence to the stack. Two doors, for loading and unloading the kiln, are located on opposite sides.

Loading is done by hand. The crude lump gypsum, specially selected for color and purity, is broken into lumps not less than 6 in. nor much greater than 10 in. in size. The lumps are stacked carefully in the kiln, care being taken to insure that the hot gases will have access to the whole charge and be free to escape through the grating. When the kiln is loaded, the doors are filled in with fire brick and sealed with fire clay.

Method of Firing

The usual method of firing is to carry a low heat at first and gradually increase it to the maximum temperature. Thermocouples inserted into the kiln at convenient points register the temperatures on recording pyrometers. From 4 to 5 days are required for calcining a charge of 100 tons. The fuel consumption for the above type of kiln of 100 tons capacity is about 26 gal. of fuel oil per ton. Single-boil stucco, by the kettle process, requires about 7 gal. per ton, and double-boil 9 gal.

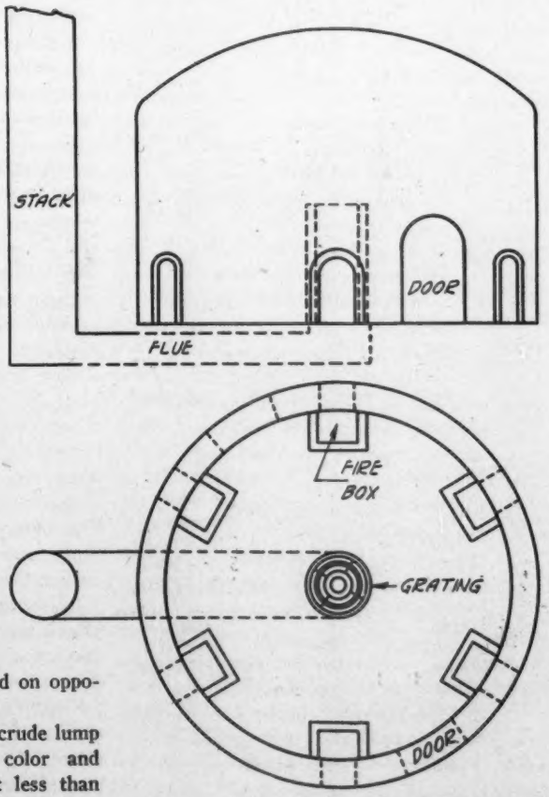


Fig. 9. Kiln for making Keene's cement

Temperature readings of a "burn" that required 4 days are given in the calcination chart:

KEENE'S CEMENT CALCINATION

Days	Pyrometer readings No. 1	No. 2	No. 3	No. 4
½	0	0	0	400 F.
1	300 F.	0	0	800
1½	600	150 F.	300 F.	950
2	750	400	500	1050
2½	850	750	700	1100
3	950	900	900	1150
3½	1050	1050	1000	1200
4	1100	1100	1050	1250
4½	1200	1200	1050	1300
5	1250	1250	1250	1300

The calcined material, after cooling for several days, is crushed and pulverized to a fineness of about 95% passing the 200-mesh sieve. Some manufacturers grind their product to less than 90% through the 200-mesh. Properly calcined, Keene's cement grinds easily, but if the material is burned to a bright red heat it is very difficult to grind to the above fineness. This product is a true dead-burned gypsum and lacks the properties of Keene's cement.

The pulverized material is elevated to storage bins located above the mixing machines. A small percentage of chemicals is added, and the mixing is done in the usual manner. These chemicals include dehydrated alum, potassium and sodium sulphates and borax. Usually, only two chemicals are added. The total amount seldom exceeds 1% of the plaster. The chemicals are ground to an impalpable powder.

Effect of Chemicals

The chemicals are added to control the setting time and to increase the stength and hardness. Keene's cement without chemicals sets rather slowly and takes a long time to attain its maximum strength, which is much lower than that of the regular finished product. According to one authority, "the increased strength and hardness is due to the reaction of the aluminum and potassium sulphates with the calcium carbonate in the gypsum, converting all of the carbonate into gypsum!"

A small percentage of the calcium carbonate in the gypsum is burned to lime (CaO) at the calcining temperature, 1250 deg. F., and a reaction can easily occur be-

tween the acidic alum and the caustic lime, according to the equation:

$$\underset{\text{Dehydrated aluminum}}{Al_2(SO_4)_3 \cdot K_2SO_4} + \underset{\text{Lime}}{3CaO} + \underset{\text{Water}}{9H_2O} =$$

$$\underset{\text{Aluminum hydrate}}{Al_2O_3 \cdot 3H_2O} + \underset{\text{Postassium sulphate}}{K_2SO_4} + \underset{\text{Gypsum}}{3CaSO_4 \cdot 2H_2O}$$

The potassium sulphate is, in the writer's opinion, the more important of the two sulphates, and the explanation for the increase in strength may be due to the catalytic action, of the potassium salt, by which the solubility of the Keene's cement is increased, causing it to crystallize to gypsum. If Keene's cement, without chemicals, is mixed with water and allowed to set, it does not revert to gypsum to any appreciable extent. But the addition of 0.5% potassium sulphate causes the greater portion of it to revert to gypsum, i.e. when the Keene's cement sets with water. These statements are based on the following experiment:

Experiment. Three samples of Keene's cement, one containing no chemicals, another containing 0.5% potassium sulphate and another containing 0.5% potassium sulphate and 0.5% dehydrated alum, were mixed with 35% water and allowed to set and dry to constant weight. A portion of each test piece was then analyzed for water content. At the end of two years, a portion of the test piece which contained the potassium sulphate and the alum was analyzed for water content. The results are here tabulated:

Material	Water content
Keene's cement (powder) containing no chemicals	0.10%
Keene's cement (powder) containing 0.5% potassium sulphate	0.17%
Dehydrated alum (powder)	7.79%
(1) Set Keene's cement pat containing no chemicals	3.73%
(2) Set Keene's cement pat containing 0.5% potassium sulphate	12.50%
(3) Set Keene's cement pat containing 0.5% potassium sulphate and 0.5% dehydrated alum	13.10%
(3) Two years later	13.16%

It will be noted that the alum does not assist the hydration of the plaster appreciably. The catalytic action of the potassium sulplate has been utilized in the production of a plaster from the native anhydrite; this will be referred to later.

The water ratio, or the water required for normal consistency, is very low for Keene's cement—about 35% as compared with 70% for single-boil stucco. Therefore, Keene's cement is very dense and only slightly porous. These properties, combined with the strength and hardness imparted by the addition of the chemicals, make it a very desirable hard-finish plaster.

The setting time (with chemicals) is from 1 to 2 hours initial, and from 2½ to 4½ hours final. The setting time without chemicals is between 5 and 6 hours. The small percentage of lime derived from the decomposition of the calcium carbonate in the raw gypsum assists in retarding the set. Indeed, lime is a retarder for Keene's cement and anhydrite plasters, whereas it accelerates single- and double-boil plasters. The latter accelerates Keene's cement, and Keene's cement accelerates them. Raw gypsum is not a good accelerator for Keene's cement. The results given below of tests on various mixtures of Keene's cement (containing no chemicals) and one of the other three products, single-boil, double-boil and raw gypsum, are interesting.

The action of the addition of 1% of raw gypsum to the Keene's cement is unexpected; this amount, if added to cold single- and double-boil plasters would accelerate the setting time to about 6 min.

The results given show the necessity for the long calcination of Keene's cement. If the lumps contain cores of partially dehydrated gypsum, the product will be quick setting. This fault may be partly remedied by the addition of a small amount of commercial retarder, but the setting time of the finished product will not be uniform, due to the fact that the partially dehydrated cores will not be uniformly distributed in the entire "burn."

Keene's cement does not heat when it is mixed with water. Aging has very little effect on its properties or composition, except that the small amount of free lime present will be converted to the hydrate or the carbonate.

The following percentages of uncombined water will be found:

Keene's cement 1 week old	0.1%
Keene's cement 2½ years old	0.4%

The tensile strength of neat and sand briquettes, at different periods, of a particular brand of Keene's cement is given below.

TENSILE STRENGTH OF KEENE'S CEMENT

Period	Lb. per sq. in. Neat	Lb. per sq. in. 1 Keene's cement; 2½ Standard sand
12 hours	305	.....
1 day	390	175
2 days	400	190
4 days	470	195
7 days	495	206
14 days	510	215
28 days	550	230

MIXTURES AND SETTING TIME

Parts of Keene's cement	Parts of single-boil	Setting time	Parts of double-boil	Setting time	Parts of raw	Setting time
100	0	5 hr. 00	0	5 hr. 00	0	5 hr. 00 min.
100	1	3 hr. 45	1	2 hr. 25	1	5 hr. 15 min.
90	5	17½ min.	5	14 min.	5	3 hr. 52 min.
80	10	12 min.	10	12 min.	10	2 hr. 50 min.
70	20	10 min.	20	11 min.	20	2 hr. 40 min.
60	30	10 min.	30	10 min.	30	2 hr. 25 min.
50	40	9 min.	40	10 min.	40	2 hr. 15 min.
40	50	8 min.	50	9 min.		
30	60	7 min.	60	8 min.		
20	70	6½ min.	70	7 min.		
10	80	7 min.	80	7 min.		
5	90	7 min.	90	7 min.		
1	100	11½ min.	100	11 min.		
0	100	15 min.	100	16 min.		

Anhydrite

The mineral anhydrite is nearly always associated with gypsum. It is found in large pockets and veins embedded in the gypsum, and, in many districts, forms the strata underlying the latter. The line of demarcation is very sharp. In many localities the anhydrite is more plentiful than the gypsum, but, as a rule, it is not encountered en masse until most of the gypsum has been recovered.

Anhydrite is not suitable for the manufacture of plaster similar to the products of single- or double-boil gypsum stucco. It has a low economic value. Many attempts have been made to find uses for the large resources of this mineral. Whether or not it can be used for retarding portland cement has not been proved satisfactorily. Various experiments gave conflicting results. The writer, at one time, carried out some tests along this line, and found that by treating the anhydrite, before mixing it with the cement clinker, better results, were obtained than with the untreated anhydrite. The tests were not conclusive, and further work will be carried out later.

Attempts have been made to hydrate anhydrite in gypsum. Observations of deposits that have been exposed to the weather have shown that a thin film of gypsum forms on the surface. Where the anhydrite has been broken into lumps, thus increasing the surface area, the effect of weathering is very marked. The hard mineral becomes friable, large cracks develop and the lumps disintegrate. This disintegration may be due to the increase in volume that must accompany the change to gypsum. The latter occupies 27% more volume than an equal weight of anhydrite. Heat, at a high temperature, is required to change gypsum to a product similar to the natural anhydrite, and the hydration of the latter will be accompanied by an evolution of heat. Water is essential to the reaction. The observed cases of hydration of anhydrite, described above, probably occurred during the cold and wet weather.

In the utilization of anhydrite, the most promising results have been obtained in developing it for making plaster. In this line of research, one experimenter calcined the material in kettles, and he claimed good results. Several years ago the writer developed some formulas for the manufacture of a plaster from anhydrite. No calcination was necessary, and the product of each

formula constituted a ready-to-use plaster. Two of the formulas are given below.

FORMULA A

Finely pulverized uncalcined anhydrite	1000 parts
Finely pulverized potassium sulphate	5 parts
Finely pulverized zinc sulphate	5 parts
Finely pulverized dehydrated alum	5 parts

FORMULA B

Finely pulverized uncalcined anhydrite	1000 parts
Finely pulverized potassium sulphate	5 parts
Finely pulverized zinc sulphate	5 parts
Finely pulverized anhydrous sodium sulphate	5 parts

The plaster made according to these formulas set in from 1 to 2 hours. It hardens very much slower than Keene's cement, but eventually attains considerable strength and takes on a very good polish. A test piece of the plaster has not cracked or disintegrated after 5 years.

In 1926 Prof. Budnikoff suggested sodium bisulphate as the best accelerator (or catalyzer) to be used with pulverized anhydrite. In 1929 he qualified this by recommending a mixture of sodium bisulphate and copper sulphate.

Quoting from an extract in January 4, 1930, issue of Rock Products, "An excellent white cement made from anhydrite (patented) develops 500-550 lb. in 24 hours, and 800 lb. in 28 days; it is hard enough to take a polish. The fuel costs are comparable with present practices of calcining gypsum."

In the latter process, it is evident that the material is calcined. Whether the above results of tests represent tension or compression was not stated, but if they represent tension tests, then the product is stronger than Keene's cement and justifies the expenditure on fuel for calcination.

(To be continued)

Design of a Concrete Mixture

Reviewing Some Experiments in Iowa Highway Building

THE method of designing concrete mixtures described by Talbot and Richart (Bulletin No. 137, Engineering Experiment Station, University of Illinois) is growing in favor. The highway departments of Illinois and other states have adopted it fully or in part as a method of designing highway concrete. A paper presented by Bert Myers and Mark Morris at the tenth annual meeting of the Highway Research Board describes the design of a mix by a variation of this method for use in Iowa highways. The authors of the paper are engineers of the Iowa State Highway Commission.

Densest Concrete Is Strongest

The basis of Talbot and Richart's method is that the densest concrete is the strongest. Hence there is a relationship between the voids in the concrete and its strength. And since the voids are practically all confined to the mortar the design of mix is based on the mortar voids. These are determined experimentally for various mixtures of sand, cement and water by weighing known volumes of mortars. In the design described in the paper the mortar was made with sand-gravel, which is a coarse sand much used as a complete aggregate in western Iowa and eastern Nebraska. There was abundant information available about mortars made from this material. Later crushed limestone became available and it was desired to add this to the sand-gravel, which required a redesigning of mix and a recomputation of the materials and cost. It may be noted that the result is an unusual concrete, the mortar being made with a sand graded all the way from 100-mesh to ¾-in.

Straight sand-gravel concrete was sufficiently plastic with basic water content, that which gave the lowest voids in the mortar experimentally. It also gave the lowest voids when it was placed in the pavement, but this was not found to be true when limestone was added. Additional water was required, not to give plasticity but to make concrete of maximum density when placed in the pavement slab. The writers say of this: "They have found that this additional quantity of water required varies with the kind of coarse aggregate used. It is greater when the coarse aggregate used is broken limestone than when it is gravel. This difference is apparently due to characteristics other than the absorption of the aggregate as it is still apparent after corrections are made for absorption." They add that it seems reasonable to suppose that the additional water required is needed to wet the surfaces of the coarse aggregates.

To find the difference between the water required to make mortar of a definite plasticity and concrete of the same plasticity made with the same sand and water, a study of concrete was undertaken. The method used was that which is used to find the basic water content of mortars (weighing the mortar in a cylinder of a known capacity). But in this case the cylinder was 6 in. in diameter and 12 in. high. The concrete was put in the mold and consolidated in a manner which conformed to A. S. T. M. specifications for molding concrete specimens.

The paper continues with a description of the design of a mix which should have a strength of 4000 lb. per sq. in. in 28 days. The ratio of a fine aggregate to coarse aggregate was as 1 is to 1.5, it being remembered that the fine aggregate was coarser than ordinary sand. It is also the custom to use oversanded mixtures in Iowa. The relative water content of the mortar was 1.215, which from the experience of designers was raised to 1.25 for field work. When this concrete was mixed and placed in the highways a hemispherical dish with a radius of the depth of the slab was placed on the grade and filled as the slab was poured and finished. The sample caught in this dish was used to examine the characteristics of the concrete. The following table shows how closely the concrete used checks the concrete design:

	Concrete designed	Concrete used
Water cement ratio, lb. per. lb.	0.447	0.445
Water cement ratio, gal. per bag	5.04	5.01
Abs. vol. cement per cu. ft. of concrete	0.1085	0.1092
Abs. vol. water per cu. ft. of concrete	0.2918	0.2895
Abs. vol. coarse aggregate per cu. ft. of concrete	0.4378	0.4342
Abs. vol. air voids per cu. ft. of concrete	0.0096	0.0143
Voids-cement ratio, cu. ft. per bag	0.730	0.733
Bbl. cement per cu. ft. of concrete	1.528	1.536

What Is Successful Concrete Design?

The authors of the paper thought that the design of concrete may be considered successful if the mixture is sufficiently workable for the purpose intended, the strength obtained is that desired, and the quantities of the materials are those estimated from the design data. In case of this design the consistency was satisfactory. The cement used was 0.52% greater and the aggregate 0.8% less than the quantity estimated. The strength was somewhat higher than was required. A weighted average of the strengths given in a table in the paper is about 4220 lb. The highest and lowest strengths vary from the average, the usual 8 to 10%. The cost of the materials was 0.03% less than the cost estimated from the designed data. The paper says of this method:

"The mixture was designed from the mortar-voids characteristics of the particular sand at the relative water content to be used in the concrete. Talbot and Richart suggest designing concrete mixtures from the voids-strength relationships of mortar of basic water content through the device of applying a reduction factor in case the consistency desired requires a water content other than basic. It seems a logical application of the basic principles of their method to design the concrete mixture from the characteristics of mortar of the relative water content required for the concrete."

Sand and Gravel Production of Memphis, Tennessee

Is Rather Well Systematized; Diesel-Engine Power Is Largely Used; Recent Improvements Bring Plants Up-to-Date

By Earl C. Harsh
Associate Editor, Rock Products

PRACTICALLY ALL of the sand and gravel produced in the territory immediately adjacent to Memphis, Tenn., comes from three plants.

These plants, in the order of their size, are operated by the Central Sand and Gravel Co. (now a part of the General Aggregates Corp.), the Missouri Portland Cement Co. and the Wolf River Sand and Gravel Co. The plant of the Central Sand and Gravel Co. has a capacity of approximately 2500 tons per day and the others somewhat less.

The Central company dredges its material from the Mississippi river and obtains a product which runs mostly to gravel, while the other two plants dredge their materials from land deposits near the Wolf river, obtaining products which run mostly to sand.

The three operations are all different and have several features of interest.

The dredging operation of the Central Sand and Gravel Co. is carried on about 40 miles up the river by a Diesel-engine operated suction dredge, and the material is transported down the river in barges by a new and modern Diesel-engine towboat to the plant, about 7 miles south of the down town section of the city, where it is washed and sized.

Washing plant and storage yards of Central Sand and Gravel Co.

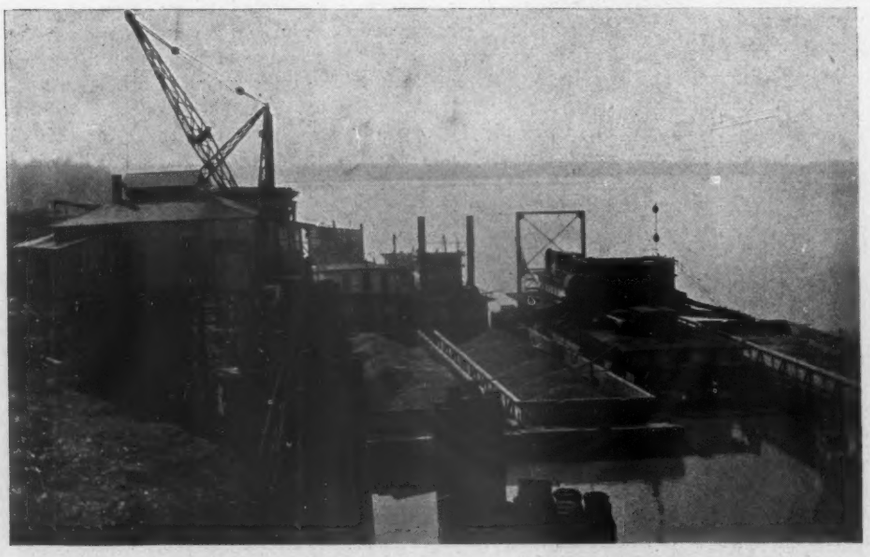
The Missouri Portland Cement Co. takes its material from an inland lake, using a Diesel-engine operated suction dredge loading to one of two barges. These are moved by cables to and from the plant, where the material is washed and sized. Entirely new screening and washing equipment has just been installed.

The Wolf River Sand and Gravel Co. obtains its material in a similar manner from an inland lake, using an electric-motor driven suction dredge. This pumps to one of two dewatering sumps on shore, from which it is handled to the plant for washing and sizing.

These two plants are quite close together, and about three miles northeast of the down town section of the city.

An interesting feature of these two operations is that they both make use of high pressure water jets around the suction inlet in order to loosen up the deposit so that the material may be readily handled by the pump.

Also of interest is the increasing tendency throughout this whole section to use Diesel-engine power instead of electric power, because of the feeling on the part of the producers that electric power rates are too high, and the power supply subject to interruptions.



Part of fleet of Central Sand and Gravel Co. at Memphis, with unloading rig at left

Central Sand and Gravel Co.

The Central Sand and Gravel Co. formerly made use of a steam-operated dredge in connection with a steam towboat for handling the barges, but about a year ago put into service a new dredge and a new towboat, both Diesel-engine operated, and with steel hulls.

The dredge, named the *Henry McCourt*, has a 240-hp., 4-cylinder Fairbanks-Morse Diesel engine driving a 15-in. Ellis centrifugal pump, through a Cutler-Hammer magnetic clutch. A 50-kw. Fairbanks-Morse direct-current generator, driven from the engine shaft through a Link-Belt silent-chain drive, furnishes electric power for part of the auxiliary equipment.

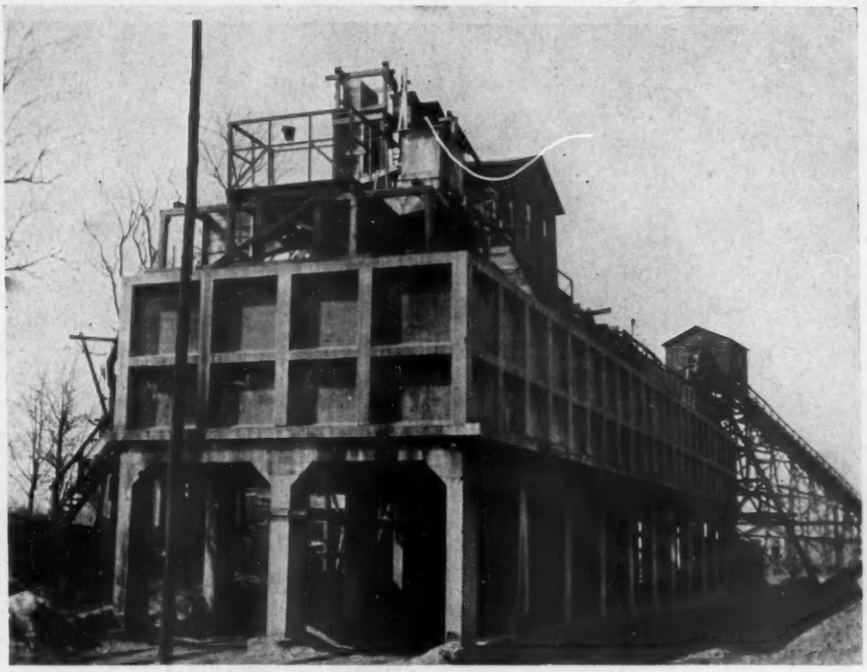
A two-drum Flory electric hoist, with a

cable running to each end of the dredge, is used to move the barge while loading, and two single drum Mead-Morrison steam hoists are used for the anchor cables. Steam for these hoists is supplied by an oil-fired vertical boiler.

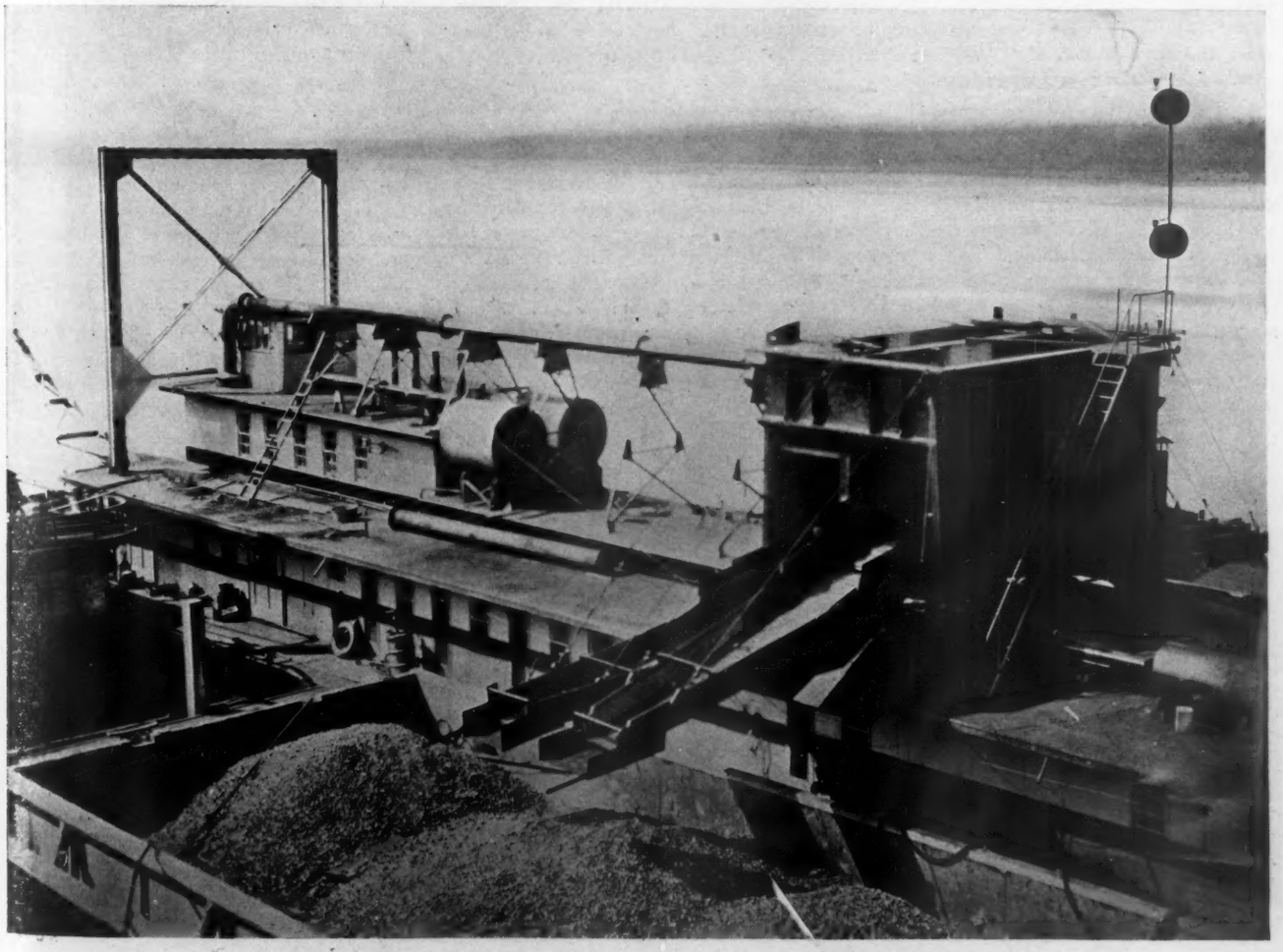
The discharge line of the pump is carried over the top deck to a double hopper provided with grizzly screens, from which the material is spouted to barges on either side.

A fleet of 13 steel barges is used, eleven of which have a capacity of 750 tons each, the other two being 1250 tons capacity. Four of these are usually handled together in one tow. When dredging conditions are right one of the barges can be loaded in about two hours.

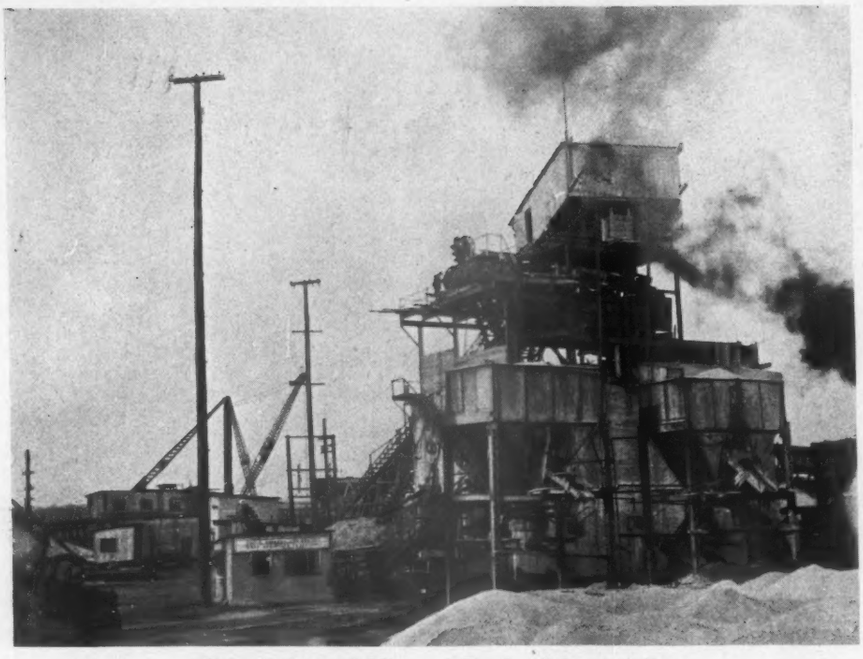
The towboat, named the *W. W. Fischer*, is of the twin propeller type, and is one of the best and most modern on the river. Two 360-hp., 6-cylinder, Fairbanks-Morse Diesel engines furnish the power for propelling, while a small 3-cylinder Fairbanks-Morse Diesel engine unit, with direct-connected air compressor and generator, furnishes auxiliary power and compressed air for starting. Electric current for the lighting system is provided by a 5-kw. Kohler engine-driven unit. The fuel oil storage tanks on board have an aggregate capacity of about 20,000 gal. For refueling the dredge, oil tanks are carried on certain of the barges, on the deck, so that they may be emptied by gravity to the storage tanks in the hull of the dredge. A considerable saving in both fuel and labor costs has been effected over the old steam operation, it



Concrete bins of Central Sand and Gravel Co.



Dredge "Henry McCourt," belonging to Central Sand and Gravel Co.



Gravel plant of Missouri Portland Cement Co.

being understood that the steam towboat required about 100 tons of coal per week, whereas the Diesel towboat can be operated on 4000 gal. or less of fuel oil for the same period.

Unloading of the barges at the plant is done with a 3-drum American Hoist and Derrick Co. steam-operated rig with a steel derrick and 2½-yd. Haywood bucket, emptying to a hopper over a 30-in. inclined belt conveyor carrying up to the washing and screening plant. A 2-drum steam hoist with cable is used to move the barges while unloading.

The washing plant was built eight years ago. Long reinforced-concrete bins extending over two railway tracks and with 12 compartments on a side are used for car loading. From the main conveyor the material discharges to a revolving screen where the oversize is scalped out and the balance carried on a belt conveyor and movable tripper to any one of several bins. The oversize is spouted to a 7-in. Allis-Chalmers Newhouse crusher for re-crushing. The re-crushed material and that from the bins is carried on an inclined belt conveyor alongside the loading bins to two sets of washing jigs, equipped with ¼-in. mesh wire screen cloth, where the material is washed and the sand separated from the gravel. The jigs are of the type having eccentric-operated vertical plungers and a number of compartments, each stepped down successively, in each of which the plungers force water back and forth through the bed of material.

From the jigs the gravel is carried up on a bucket elevator to a 4-ft. by 8-ft. triple-deck Allis-Chalmers vibrating screen above the bins, arranged with rinsing jets above, where the gravel receives its final washing and sizing.

The sand from the jigs goes to a sump from which it is handled by a 6-in. centrifugal pump to a box over the bins, flowing from there to a 3-ft. by 8-ft. Universal vibrating screen and over gravity screens to take out the torpedo sand. The finer sands are flumed to automatic bottom discharge Stephens-Adamson settling tanks and to the bins.

Water for the operation of the jigs is supplied by a centrifugal pump of 2000 g.p.m. capacity using river water, while the final rinsing water used on the vibrating screens is taken from a deep well by an 8-in. Layne centrifugal pump of 500 g.p.m capacity powered with a 60-hp. motor.

Missouri Portland Cement Co.'s Sand Operation

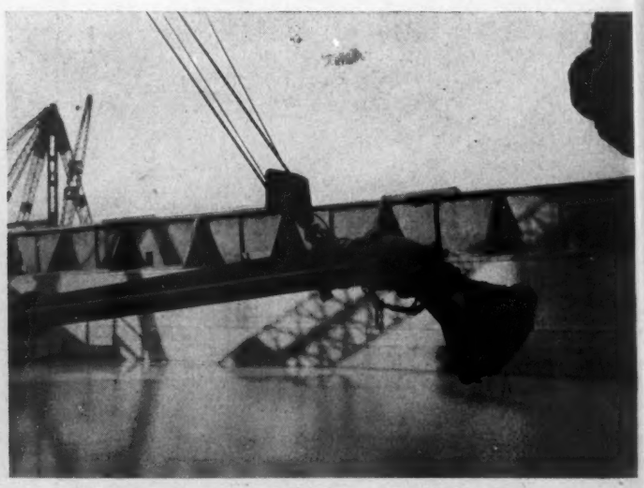
The Missouri Portland Cement Co.'s plant has been operated for about ten years, dredging from a sand deposit.

A large steel-hull dredge is used, powered with a 425-hp. 8-cylinder, Busch-Selzer Diesel engine which is connected to a 15-in. Ellis centrifugal pump through a Cutler-Hammer magnetic clutch. Between the engine and clutch is mounted a 150-kw. Westinghouse, 3-phase, 60-cycle, 220-volt alternating-current generator, which furnishes electric power for the auxiliary equipment.

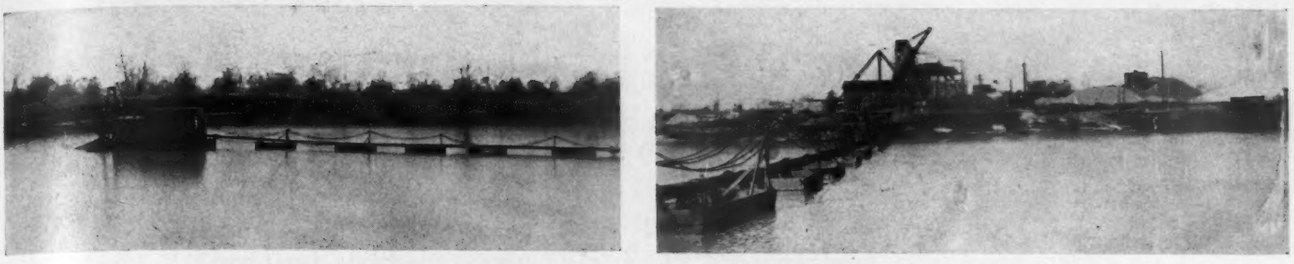
The pump discharge is carried over the top deck to a revolving screen from which the scalped material is flumed to a barge alongside, and the excess water and fine material are flumed over the opposite side.

Two steel barges are used, which are moved back and forth alternately between the dredge and the unloading point by means of a cable and hoist at each point. These are deck barges of steel construction and hold about 700 cu. yd., or about 16 carloads of finished material each.

Of interest in connection with the dredge operation is the use of high pressure water jets around the suction inlet to loosen up the deposit.



Barges and suction line of Missouri Portland Cement Co.'s sand plant, with detail of suction inlet showing high-pressure water line alongside



Dredge and plant of Wolf River Sand and Gravel Co.

At the unloading point a steel derrick rig with a 3-yd. Hayward clamshell bucket handles the material from the barge to a hopper feeding a 30-in. inclined belt conveyor, which carries up to the washing and sizing plant. This rig was formerly steam operated but has just been connected to electric operation by the installation of a 300-hp. Westinghouse slip-ring motor with Westinghouse magnetic brake.

Plant of Wolf River Sand and Gravel Co., with derrick handling product from sump to hopper at foot of belt conveyor

For washing and sizing, a complete new installation is just being completed (March, 1931), using equipment furnished by the Smith Engineering Works, Milwaukee, Wis.

From the main belt conveyor at the top of the plant the material is flumed to three parallel 3-ft. by 8-ft. double-deck Telsmith vibrators, where the sand is removed from the gravel through ¼-in. mesh wire cloth on the lower decks. The top decks are equipped with ¾-in. mesh wire cloth to relieve the lower deck of part of the load. All plus ¼-in. material is spouted to two heavy duty Telsmith double-log washers, each mounted in an 8-ft. by 20-ft. steel box, from which the washed gravel will be discharged to the boot of a belt bucket elevator, this elevator carryng up to a single jacketed revolving screen for sizing and final rinsing. The new equipment is supported on a steel structure over the bins.

At present surplus material is handled in and out of storage piles by two steam locomotive cranes, but an Industrial Brownhoist Diesel-engine-driven crane with a 1-yd. clamshell bucket has been purchased and it is expected will be put into service soon.

Wolf River Sand and Gravel Co. Has Washing Plant

The Wolf River Sand and Gravel Co. operation is near that of the Missouri Portland Cement Co. and is of a similar nature. It is the oldest operaton of the three.

An electric-motor-driven suction dredge is used, pumping alternately to two sumps on shore, from which the material is handled by clamshell to a belt conveyor carrying up to the top of the washing plant.

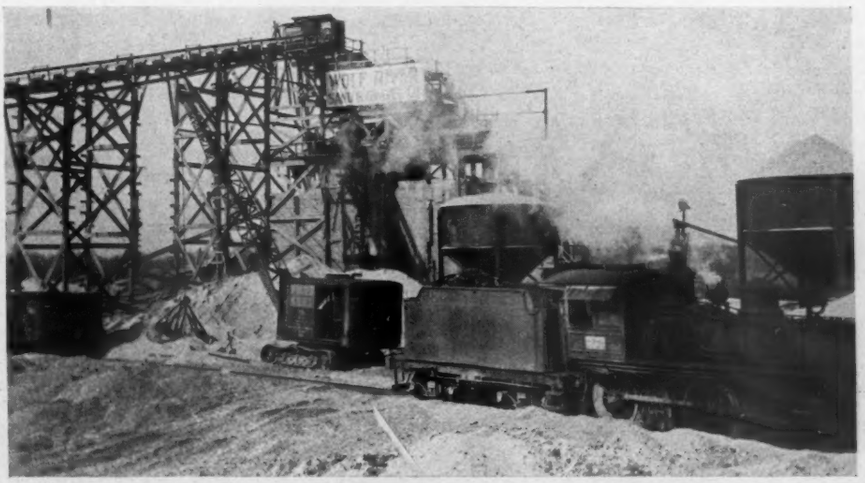
On the dredge a 12-in. Ellis centrifugal pump is used, driven by a 400-hp. Westinghouse slip-ring motor. A circle of eight ¾-in. streams of water around the suction inlet is used to loosen up the deposit, so that the material may be picked up by the pump suction. Water for this purpose is furnished at 120-lb. pressure by a 6-in. Fairbanks-Morse centrifugal pump, driven by a direct-connected 75-hp. motor. Another small motorized pumping unit is used for priming and for the water seal at the shaft stuffing box on the pump.

On shore an American Hoist and Derrick Co. motor-driven rig with 2-yd. Williams clamshell bucket is used to handle the material from the sump to a hopper over the lower end of the belt conveyor. Each sump is roughly from 50- to 75-ft. in diameter.

Settling Box Installed

At the top of the washing plant the material is discharged from the belt to a Stephens-Adamson Gilbert conical scalping screen and then is flumed on to two parallel Gilbert conical screens with ¼-in. perforations. Here the fines are flumed to a new steel sand settling box, just installed and the gravel goes to a 12-in. double-screw Perfect classifier for washing, and then to a 3-ft. by 6-ft. Simplicity vibrating screen for final rinsing and sizing. An 8-in. centrifugal pump furnishes water for the conical revolving screens and flumeways, and a 6-in. pump for the vibrating screens.

A 1-yd. American Hoist and Derrick Co. gasoline engine-driven caterpillar crane is used for handling material in and out of open storage piles, and a steam locomotive for switching cars.



Washing plant of Wolf River Sand and Gravel Co., Memphis

Researches on the Rotary Kiln in Cement Manufacture†

Part XVI—For Fuel Economy It Is Essential to Utilize High-Grade Heat for High-Grade Thermal Work and Low-Grade Heat for Low-Grade Thermal Work—The Entropy of Portland Cement Formation

By Geoffrey Martin

D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

Abstract

IN THIS INSTALLMENT the author outlines the theory of heat utilization in chemical reactions such as the formation of portland cement clinker.

He points out how most so-called heat balances of cement kilns are valueless because only the amount of heat units is taken into consideration.

Temperatures, or thermal pressures, are equally important, because heat for various chemical reactions is usable only if it has certain temperatures or pressures.

The theory and mathematics of heat application to the making of steam in boilers has been thoroughly and completely developed, under the term "Entropy." The author applies entropy to portland cement manufacture, in so far as the necessary fundamental data are known.

This installment is of equal interest and value to Lime Manufacturers, because exactly the same principles apply. This was brought out by Victor J. Azbe in his series of articles on the "Theory and Practice of Lime Manufacture," published in Rock Products, 1925, in somewhat less mathematical style.—The Editor.

IT IS ESSENTIAL to grasp the difference between high-grade and low-grade heat. Neglect of the fact that 1 B.t.u. when liberated at a high temperature can do very different amounts of thermal work than when liberated at low temperatures has caused the heat balance of the rotary kiln to be much misunderstood, and very misleading practical consequences have as a result been reduced therefrom, which have led to serious errors in kiln design.

Distinction Between High-Grade and Low-Grade Heat

In order to illustrate the difference between high-grade and low-grade heat let us consider 11.278 lb. of combustion gas produced by burning 1 lb. of standard coal with 10.478 lb. of air (see Part XI), which occurs in the ordinary rotary cement kiln. If, as in the ordinary kiln, the flame temperature of the resulting gas is 2,600 deg. F., then 11.278 lb. of combustion gas falling in temperature from 2,600 deg. to 60 deg. F. can liberate 8,332 B.t.u.

Now mix this hot gas with 10.727 lb. of air at 60 deg. F. Then the resulting mixture will acquire a temperature of 1,481 deg. F. If now the mixture of 22,005 lb. of gas be allowed to fall in temperature from 1,481 deg. to 60 deg. F., then precisely the same amount of heat as before will be liberated, viz., 8,332 B.t.u. *So that 11.278 lb. of furnace gas falling in temperature from 2,600 deg. to 60 deg. F. will evolve exactly the same number of B.t.u. as 22.005 lb. of mixed gas falling from 1,481 deg. to 60 deg. F., viz., 8,332 B.t.u.*

But these two lots of 8,332 B.t.u., although equal in number, are not identical in properties. There is this vital difference between them—the 8,332 B.t.u. from the furnace gas can produce 3.993 lb. of clinker (as shown in Part XV—Table I), whereas the 8,332 B.t.u. from the mixed gas are *unable to produce a single ounce of clinker.* The first lot of B.t.u. consists of what we term high-grade heat, while the other lot consists of low-grade heat. *Hence high-grade heat does not act in the same way as low-grade heat.*

A certain number of B.t.u. available at a high temperature will act entirely different from, and possess an entirely different value from, the same number of B.t.u. which are only available at a low temperature. There is as much difference between one unit of high-grade heat and one unit of low-grade heat as there is between 1 lb. of diamonds and 1 lb. of coal. In the first case the same *amount* of heat is available, but its *quality* is different. In the second case the same *amount* of carbon may be available, but its *quality* is different.

Now let us go back and consider in greater detail the nature of the B.t.u. evolved from the 11.278 lb. of furnace gas.

As explained in Part XV, *the high-grade heat available for clinker formation consists of those B.t.u. which are evolved by the gas above the temperature level of* 1,481 *deg. F.* (the temperature of decomposition of the $CaCO_3$ in the kiln).

Hence in this case, since 3,704 B.t.u. are evolved by 11.278 lb. of furnace gas sinking from 2,600 deg. to 1,481 deg. F. out of the total of 8,332 B.t.u. contained in the gas, only 3,704 are available for clinker formation, and the remaining 4,628 B.t.u. (which are evolved between 1,481 deg. and 60 deg. F.) can only be used in the dehydrating and preheating zone for evaporating water and the like.

Hence we have this *vitally important fact.* Although the *whole* 8,332 B.t.u. contained in the 11.278 lb. of combustion gas between 2,600 deg. and 60 deg. F. can be utilized for evaporating water and preheating slurry, if we so desire, it is impossible to employ them all in making clinker. Only the 3,704 B.t.u. can be employed for making clinker, and therefore, so far as the cement manufacturer is concerned, these 3,704 B.t.u. are especially valuable, whereas the remaining 4,628 B.t.u. possess little value.

If, therefore, any of these valuable 3,704

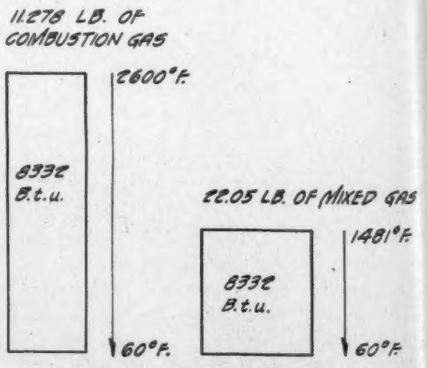


Fig. 1. Illustrating that the same number of B.t.u. can be obtained from 11.278 lb. of furnace gas sinking from 2600 deg. F. as from 22.05 lb. of mixed gas sinking from 1481 deg. F. to 60 deg. F.

B.t.u. are employed in doing the low-grade thermal work of evaporating water or preheating slurry, we are using valuable high-grade heat in doing inferior thermal work, which can be done equally well, if not better, by the more abundant and cheaper low-grade heat.

It is as if we are employing a valuable race-horse for drawing a plough instead of employing the much cheaper cart-horses for the job, or as if we are throwing diamonds into a furnace to develop heat instead of employing ordinary coal.

This, then, is what happens when the furnace gases are allowed to escape from the decarbonating zone at any temperature above 1,481 deg. F. (1,371 deg. C.). They are carrying with them unutilized a certain proportion of high-grade heat, which is then utilized in evaporating water in the lower part of the kiln. Let us illustrate this by a concrete case.

Suppose that the furnace gases in the kiln escape from the decarbonating zone into the dehydrating zone at a temperature of, let us say, 1,800 deg. F. Then the total heat contained in 11.268 lb. of the combustion gas between 1,800 deg. and 60 deg. F. is 5,649 B.t.u., *all of which* is available for evaporating the water and drying the slurry. Yet of these 5,649 B.t.u. only 1.021 are available for forming clinker, and therefore, if these 1,021 B.t.u. are allowed to escape into the evaporating zone and be employed in evaporating water instead of liberating clinker, it is obvious that a very serious loss of high-grade heat is going on.

This loss is all the more serious because if the above-mentioned 1,021 B.t.u. were employed in forming clinker, they would liberate at 1,481 deg. F. no less than 0.51 lb. of CO_2 from the calcium carbonate, so that the combined mass of gas passing down the kiln would still have available for evaporation of water and preheating the slurry all the 1,021 B.t.u. after this latter had performed their due work of forming clinker.

All that would have happened to the 1,021 B.t.u. after performing the thermal work of producing clinker would be that it had become transformed from the category 1,021 B.t.u. of high-grade heat (*i. e.*, heat available above 1,481 deg. F.) into 1,021 B.t.u. of lower-grade heat.

It is, therefore, an absolute and irretrievable wastage to allow any high-grade heat at all to escape into the lower part (raw material end) of the kiln without forming from it all the clinker we can.

It is as if we desired to obtain work from a high-pressure steam boiler containing steam at 250 lb. pressure, and yet before allowing the steam to pass into the cylinders of the engine we deliberately allowed the pressure of the steam to fall to, say, 50 lb. by passing it through an expansion valve. All engineers would condemn this practice, yet it is precisely similar

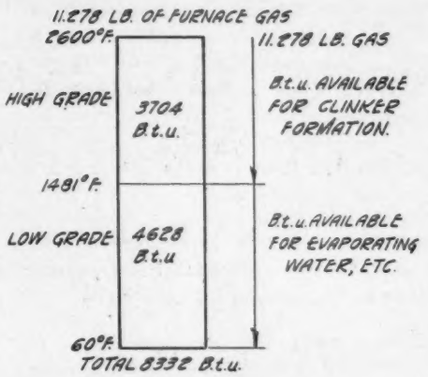


Fig. 2. Illustrating the number of high-grade and low-grade B.t.u. contained in 11.278 lb. of furnace gas heated to 2600 deg. F.

to what cement manufacturers are doing when they allow high-grade heat from the upper part of the kiln to pass uselessly down into the lower part without abstracting from it all its available capacity for producing clinker before it reaches the evaporating zone.

It is this neglect to trap the high-grade heat in the right part of the kiln which makes the ordinary cement kiln so wasteful and inefficient as a thermal engine.

The whole attention of cement manufacturers should be concentrated on keeping the high-grade heat in its proper sphere, viz., in the clinkering and decarbonating zone, and not allowing any to escape and be wasted in the dehydrating and preheating zone.

This, as will be proved in Part XVIII, is only if *the flame temperature of the gases is maintained as high as possible* in the *clinkering zone* and as much heat as possible abstracted from the hot gases in the decarbonating zone.

Development of the Notion of High-Grade Heat

On account of the vital importance of this aspect of cement manufacture we will treat the subject in a different way so as to bring into ordinary engineering practice this conception of *high-grade heat* and *low-grade heat.*

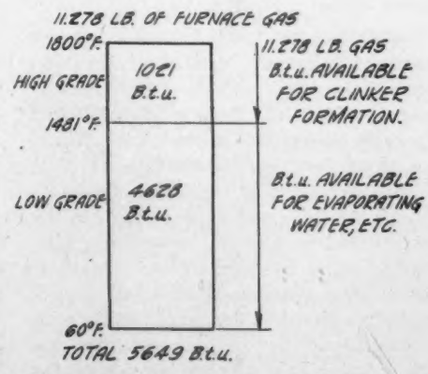


Fig. 3. Showing number of high-grade and low-grade B.t.u. when gas is heated to 1800 deg. F.

When we are dealing with furnaces in which substances are made to undergo chemical or physical changes it is not only the quantity of heat which counts but even more so the thermal pressure (or temperature, as physicists call it) at which the heat is delivered to the substance. For example, 100 British units of heat available at a thermal pressure of 212 deg. F. are much less valuable than 100 units of heat available at, say, 2,600 deg. F. In the one case 100 units of heat will produce no cement clinker at all, and in the other case the 100 units can be converted into an equivalent amount of clinker.

The ordinary thermal balance of the rotary kiln is practically useless from a technical point of view, because the quantities of heat are all expressed as so many B.t.u. without distinguishing whether these B.t.u. are available at a low thermal pressure or temperature.

We have just seen, for example, in Part XV, that when the flame temperature in the kiln is at its maximum of 5370 deg. F. (2966 deg. C.) we can produce 100 tons of cement clinker by the expenditure of only 6.36 tons of standard coal (12,000 B.t.u. per lb.; (1 ton = 2240 lb. = 1.12 American tons).

Whereas with a flame temperature of 2600 deg. F. we could produce 100 tons of clinker by the combustion of 24.8 tons of standard coal, and with a flame of only 1481 deg. F. (805 deg. C.) it is necessary to burn an infinite amount of coal in order to produce an ounce of clinker.

The case is analogous to the generation of steam in a boiler. Millions of B.t.u. passed through the heating flues of a boiler below the boiling point of water (100 deg. C. or 212 deg. F. at atmospheric pressure) will not generate steam. The elevation of the temperature of the heating gasses above 212 deg. F. is what decides the value of the heating medium so far as steam raising is concerned.

In the same way in cement production the value of the gaseous heating medium for producing cement clinker is measured by the number of B.t.u. available *above* 805 deg. C. (1481 deg. F.)—the temperature of decomposition of the calcium carbonate, $CaCO_3$, the temperature whereat the great heat absorption occurs in cement manufacture.

The Entropy of Cement Formation and Its Measure

Mathematical physicists express the fact that not only is the quantity of heat important, but also the thermal pressure or temperature at which it is delivered, by introducing the conception of *"Entropy."* The change of *entropy* of a substance is measured by the quantity of heat which passes into the substance divided by the absolute temperature at which it passes in.

In mathematical language: If ϕ be the

TABLE I—CHANGE OF ENTROPY OF THE SOLID MATERIALS WHICH OCCUR IN MAKING 1 LB. OF PORTLAND CEMENT CLINKER RECKONED FROM 32 DEG. F. AS ZERO

Temperature T. deg. F.	Temperature T. deg. F.	Entropy ranks ϕ	Remarks	Total change of entropy during different stages	Total change of entropy during different zones
32	492	0.00		0.128	Drying zone 0.124
212	872	0.124			
212	672	0.124	At beginning of 212 deg. F.	Evolution of water from hydrated silica.	
		0.130	At end of 212 deg. F.	0.006	
212	772				
312	772	0.189			
412	872	0.238			
512	972	0.282			
612	1072	0.322			
712	1172	0.358			
812	1272	0.391			Preheating zone. 0.447
912	1372	0.422			
1012	1472	0.450			
1112	1572	0.477	At beginning of 1112 deg. F.	Evolution of water from kaolin.	
		0.486	At end of 1112 deg. F.	0.009	
1212	1672	0.510			
1312	1772	0.534			
1412	1872	0.556			
1481	1872	0.591			
1481	1941	0.571	At beginning of 1481 deg. F.	Evolution of CO_2 from calcium carbonate.	
		9.989	At end of 1481 deg. F.	0.418	Decarbonating zone. 0.418
1481	1941	0.989			
1581	2041	1.0033			
1681	2141	1.0168			
1871	2241	1.0297			
1881	2341	1.0420			Sintering zone.
1981	2441	1.0539			
2081	2541	1.0651			
2181	2641	1.0761			
2281	2741	1.0864			0.0582
2381	2841	1.0967			
2481	2941	1.1063			
2498	2958	1.1080			
2498	2958	1.1080	At beginning of 2498 deg. F.	Evolution of heat due to exothermic reaction of clinker formation.	
		1.0472	At end of 2498 deg. F.	—0.0608	

change entropy, Q the quantity of heat, and T the absolute temperature, then

$$\phi = \int \frac{dQ}{T}$$

The units of entropy are termed "ranks" after the celebrated engineer Rankine, who largely developed the conception of entropy as applied to steam engine and boiler design.

Indeed, the conception of entropy is of prime importance to the steam engineer.

By its means problems in steam engineering are easily and rapidly solved which would be difficult, if not impossible, to solve by any other method.

The fundamental advances which have been made in the designing of furnace boilers and steam engines within modern times largely developed the conception of entropy and available energy. The magnificent entropy tables published by Prof. Callendar and others within recent years have made accessible to all steam engineers the necessary data. Of no less importance for correct cement kiln design is a knowledge of the magnitude of the entropy changes which occur at different stages of cement clinker formation.

Calculations made in Part XV on the thermodynamics of cement formation showed that, by suitable thermodynamic design, an ideal kiln could produce 100 tons of cement clinker by the combustion of 6.36 tons of standard coal (12,600 B.t.u. per lb.), and that by modifying the design of kilns to conform to the changes of entropy in the raw material in different parts of the kiln, kilns very much more efficient than any now existing could be constructed. Consequently practical kiln designers, familiar with thermodynamic theory, will welcome the data in Table I, in which I have calculated the change of entropy of the solid materials in making 1 lb. of portland cement clinker reckoned from 32 deg. F. as zero. As far as I am aware, this is the first time that such tables have been calculated for the cement industry. No doubt more accurate tables will in future be made possible when the thermal data relating to cement formation has been more accurately determined.

Application of the Preceding Principles to the Thermal History of Portland Cement Formation

Returning now to practical details, in order to make portland cement we must heat a mixture of clay and calcium carbonate (chalk, limestone, etc.).

But as we have seen, the heat must be supplied in a definite way. We must not only supply a certain *quantity of heat*, but we must also supply it at the right thermal pressure (or temperature as physicists say).

In order to see this let us now follow the thermal history of a batch of raw material through the kiln.

As water plays no part in the formation of cement and is a mere mechanical admixture, it simplifies the treatment of the subject to consider that the mixture is dry at a temperature of 60 deg. F. (15.6 deg. C.)

Assume that this batch of raw material consists of:

1.1905 lb. of calcium carbonate ($CaCO_3$)
0.1846 lb. of kaolin ($Al_2Si_2O_7 2H_2O$)
0.1540 lb. of hydrated silica (93% SiO_2, 7% H_2O)
0.0312 lb. of ferric oride (Fe_2O_3)

Total: 1.5603 lb.

This mixture when ignited to about 2498 deg. F. (1370 deg. C.) will form 1.00 lb. of cement clinker of the ordinary type manufactured in Great Britain.

As the temperature (or thermal pressure) of this 1 lb. mass of raw material increases —i. e., as it becomes hotter and hotter— different quantities of heat are absorbed, or so to speak pumped into the material at different temperature levels (or better at different thermal pressures).

This is shown in Table II, which I have calculated from data compiled by the British Cement Research Association.

In Making Cement It Is Necessary to Force Different Quantities of Heat (B.t.u.'s) at Different Thermal Pressures (or Temperatures) Into the Raw Materials

By studying this table you will see that between 32 deg. and 212 deg. F. the raw material must have forced into it a quantity of heat measured by 70.29 B.t.u.

So that from a practical point of view 70.29 B.t.u. must be pumped into the raw material at a *thermal pressure not below 212 deg. F.*

Next between 212 deg. F. and 1841 deg.

F. you will see that the material must have forced into it an additional 534 B.t.u.

So that the kiln designer must arrange matters that this number of B.t.u. must be available from the surrounding heating medium at a thermal pressure between 212 deg. and 1481 deg. F.

Next at 1481 deg. F.—the temperature at which the calcium carbonate begins to decompose and evolve carbon dioxide—the material must have pumped into it no less than 812 B.t.u. delivered at a thermal pressure above 1481 deg. F.

If these B.t.u.'s are available from the heating medium at a *lower* thermal pressure than 1841 deg. F. they are of no practical value so far as decomposing the calcium carbonate and expelling the CO_2 therefrom is concerned. At a lower thermal pressure than 1481 deg. F. the B.t.u.'s simply cannot be pumped into or absorbed by the material, and they pass away through the kiln unabsorbed and without doing any useful chemical work, and escape up the chimney to the air unutilized; merely increasing the exit gas temperature of the kiln in so doing.

Finally about 107 B.t.u. must be forced into the material between 1581 deg. F. and 2498 deg. F. in order to cause the lime and silica to chemically unite to form the mixture of calcium silicates known as portland cement clinker. And if these 167 B.t.u. are not available from the surrounding heating medium at a thermal pressure of about 2500 deg. F. then no cement clinker is formed, no matter how many millions of B.t.u.'s are forced through the kiln or how many tons of coal are burnt.

This fact was strikingly illustrated some years ago by costly large-scale experiments carried out by the Associated Portland Cement Manufacturers at their Swanscombe Works by Eldred. He obtained hot gas derived from a producer whose flame temperature was slightly lower than 2500 deg. F. and forced it through a rotary kiln fed with slurry. The material came out severely underburnt and the exit temperature at the end of the kiln shot up, while the fuel consumption increased enormously.

These experiments cost nearly $25,000 and demonstrated the impossibility of making cement by these methods.

(To be continued)

TABLE II—QUANTITY OF HEAT ABSORBED BY THE SOLID RAW MATERIALS IN MAKING 1 LB. OF PORTLAND CEMENT CLINKER BETWEEN 32 DEG. F. AND THE CLINKERING TEMPERATURE 2498 DEG. F.

T. deg. F.	Quantity of heat in B.t.u.			
32	0			70.29 in drying zone
212	70.29	At beginning of 212 deg. F.	Due to splitting off of water.	
212	77.09	End of 212 deg. F.		
312	117.60			
412	158.04			
512	198.59			
612	239.02			
712	279.57			
812	320.01			
912	360.54			
1012	400.89			
1112	441.42	At beginning of 1112 deg. F.	Due to splitting off of water from kaolin.	534.20 B.t.u. in preheating zone.
	455.32	At end of 1112 deg. F.		
1212	495.68			
1312	536.08			
1412	576.47			
1481	604.49	At beginning of 1481 deg. F.	811.82 B.t.u. absorbed owing to evolution of CO_2 by $CaCO_3$.	
1481	1416.41	At end of 1481 deg. F.		Decarbonating zone
1581	1444.61			
1681	1472.81			
1781	1501.01			
1881	1529.21			
1981	1557.41			
2081	1585.61	SINTERING ZONE		286.70 B.t.u. absorbed in heating the raw materials up to 2498 deg. F. and 179.93 B.t.u. are evolved when chemical union takes place making net absorption 106.77 B.t.u.
2181	1613.71			
2281	1641.91			
2381	1670.21			
2481	1698.31			
2498	1703.11	At beginning of 2498 deg. F.	Due to exothermic reaction.	
	1523.18	At end of 2498 deg. F.		

Wisconsin Ready-Mix Plant

A CENTRAL CONCRETE MIXING PLANT is being built at the quarry of the G. D. Francey Coal, Stone and Supply Co., Eighth Avenue and State Street, Wauwatosa, Wis. The ready-mix company will be known as the Certified Concrete Co. S. L. Fuller, a contractor of Wauwatosa, will be the principal owner but the stone company will furnish the aggregate and also be interested.

The stone company is also making several changes in its quarry. All changes are to be completed by April 15, it is expected.

British Columbia Gypsum Plant Ships Wallboard to Europe

THE New Westminster, B. C., plant of Gypsum, Lime and Alabastine, Canada, Ltd., is now working on an European order for 1,000,000 sq. ft. of "Gyproc" fireproof wallboard, one of the principal products of the firm.

The announcement that the plant had secured this contract was made by Frank E. Woodside of Vancouver, secretary of the British Columbia Chamber of Mines, in speaking before the New Westminster Kiwanis club.

Mr. Woodside gave the Kiwanians some additional facts in relation to the New Westminster industry and the gypsum quarries at Falkland, B. C., which supply it with the raw material.

The plant, situated on the south bank of the Fraser River just east of the New Westminster bridge, employs 70 men. It turns out 20 different products, for which it has found markets in 11 countries. At the Falkland quarries, 40,000 tons of gypsum were mined during 1930 and 30,000 tons of this material were handled by the New Westminster plant. The company employs an additional 10 or 12 persons in its office and on its sales force at Vancouver, bringing the British Columbia payroll to over 100 employes.

Norman Jessiman of Vancouver, in charge of the British Columbia operations of the company, was in New Westminster recently in connection with the shipping arrangements for the big order of Gyproc obtained from Europe. It is hoped, he stated, that arrangements can be made to have the material shipped direct from the port of New Westminster.

A busy year is predicted for the local plant by Mr. Jessiman. H. H. Phillips, of Toronto, export manager for the company, who has just concluded a visit to Vancouver and New Westminster, informed Mr. Jessiman that considerable export business, in addition to that already enjoyed by the local factory, had been secured. This business was sufficient, Mr. Jessiman said, to maintain a full staff all summer at the plant, and will insure a better season than last. Although the factory operated during the summer of 1930, a full staff was not required all the time.—*New Westminster* (B. C.) *British Columbian.*

Crush and Market Quartz

THE HARTFORD TALC CO., Inc., Baltimore, Md., announces that it has just completed a mill to grind, screen and size white quartz. The company has a large deposit of this material on its property, near Dublin, Hartford county, on the Pennsylvania railroad.

The quartz is mined from a solid vein about 50 ft. below the surface, then hauled to the mill where it is crushed and screened to various meshes.

Flomaton plant of Roquemore Gravel Co., Flomaton, Ala.

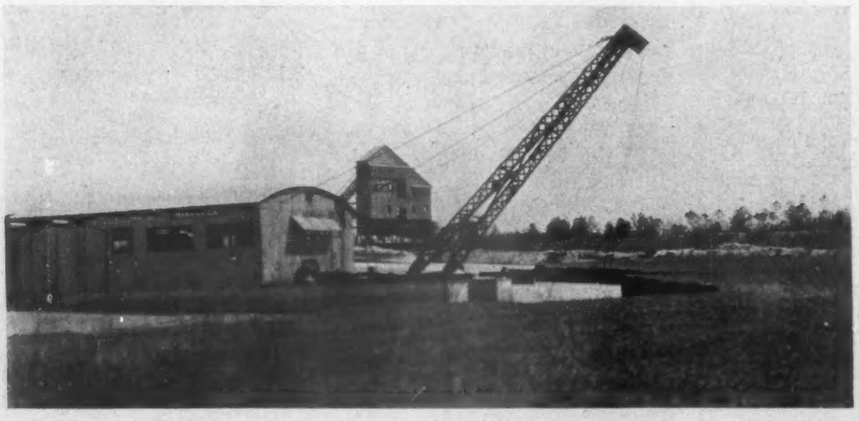
A Brief Survey of Rock Products Activities in Florida, Alabama and Mississippi

By Walter B. Lenhart
Associate Editor, Rock Products

FLORIDA'S AGGREGATE INDUSTRY is peculiar. Competitive conditions from without the state make it unusual. There is only one gravel producing company of any consequence, and that is located on the Chattahoochee river in the extreme northwestern part of the state, and it has stiff out-of-state competition from the Birmingham, Ala., slag producers. Not only does slag reach that area but the entire state as well, except possibly the section 40 to 50 miles north of Tampa, where the "hard rock" producers have their quarries. Even here some slag competition reaches in at times.

From the Mobile, Ala., territory water shipments of gravel are also made to Tampa and other Forida parts, but as the gravel is all of small size, the tonnage is limited.

Strange as it may seem, a large tonnage of gravel is shipped into Florida from Baltimore, Md., especially to East Coast points, some even into Tampa. This gravel is shipped south as ballast by coastwise cargo boats, and it gives the local aggregate producers stiff competition.



Dredge "Miss Lulu" of Roquemore Gravel Co.

Some foreign cement has been shipped into Florida, although none recently, for not only has the new tariff helped producers, but Florida users of foreign cement found that public opinion reacted to their detriment.

The volume of aggregates being moved in the state of Florida is small, and so far indications are that it will about equal that of 1930. The material is practically all used for highway construction, with the concrete road mileage about equal to that of the limerock-bituminous type peculiar to the South Atlantic states.

In Tampa, the principal industrial city of Florida, brick paving still finds political favor, although the users of streets find nothing in its favor. To date the brick has been laid on sand bases. The wavy and hard riding qualities of Tampa's streets are notorious.

Not Much Concrete Used in Tampa

In 1930, the cement interests were able to get one short street in Tampa paved with their product. It's a side street and the average tourist would not use it, but the traveler's attention is called to the fact by an imposing sign announcing that "this is the first street in Tampa to be paved with concrete," or words to that effect.

Ready-mixed concrete, owing partly to the

non-use of concrete for city work, did not prove a successful enterprise. One company started operations about a year ago, as announced in these columns, but has gone out of business, leaving no producer of ready-mixed concrete in that section at present.

Good sand is produced in the Interlachen and Lake Weir districts in comparatively small quantities due to the lack of concrete construction work. The quality of the sand is excellent, although of rather fine particle size.

Fairfield plant of Birmingham Slag Co.

Little Going On But Highway Construction

Taking the situation as a whole in the states of Georgia, Florida, Alabama and Mississippi, conditions in the rock products industries are very spotty. As outlined in a previous review of conditions in Georgia, that state has a considerable highway program. Florida is below normal if anything. Alabama, too, has an extensive highway program in the offing and Mississippi a short program, although better than in previous years.

As the work is practically all highway construction, those plants fortunate enough to be near a road project are busy; in fact, very busy, some working two or three shifts, but those not close to a highway job are practically out of the running. Thus in southern Alabama, from Flomaton north to Selma, plants are very active and expect to continue so all this season. At Montgomery business is very fair, about 100% better than last year, but the plants are not near enough to major highway projects to keep running to anything like capacity. Around Birmingham the slag and ready-mixed concrete operators are operating steadily and doing a very satisfactory volume of business. In the northwest portions of the state around Florence and Sheffield and over into Mississippi in the gravel producing sections from Iuka south to Golden and around Columbus, operations are at very low production.

Plant operations in the asphaltic limestone districts of northwestern Alabama centering around Cherokee are dormant. The three principal producers in that belt are practically idle, although one operator is expecting to resume shortly. A state highway practically paralleling this asphaltic limestone belt has been let recently but it is undecided whether the highway will be concrete or asphaltic limestone.

At Mobile, Ala., the Mobile and Gulf Navigation Co. is the leading producer, and about two years ago branched into the ready-mixed concrete business under the name of the Mobile Ready-Mixed Concrete Co. R. W. Green is manager of this company and has been successful in putting ready-mixed concrete on a successful footing at Mobile. The company uses ordinary truck bodies for transporting the product. The distance hauled is comparatively short.

Types of Alabama Sand and Gravel Operations

At Flomaton, Ala., there are two sand and gravel operations — the Roquemore Gravel Co. and the Escambia Sand and Gravel Corp. The plants in reality are in Florida, as the state line divides the town of Flomaton and these gravel operations. Both use Amsco dredging pump equipment, the Roquemore Gravel Co. a 15-in. pump and the Escambia Sand and Gravel Corp. an 8-in. pump. The larger pump is electrically driven. C. H. Harrell of the Escambia Sand and Gravel Corp. is considering the use of Diesel-engine power for his operations. John C. Hemberger is superintendent of the Roquemore operation and E. T. Quimby, chief clerk. This plant was designed and built by the F. M. Welch Engineering Service, Greenville, Ohio, and has been described in previous issues of Rock Products.

The Southern Sand and Gravel Co., Selma, some 52 miles west of Birmingham, is busily engaged in filling contracts for local highway work. This plant was built about four years ago and uses Link-Belt equipment practically throughout. The company takes its gravel from the Oklahoma river by means of a steam-driven clamshell dredge, loading to barges, which are unloaded to a plant hopper by a second clamshell rig. Rock Products published a description of this operation at the time the plant was built. The gravel from the river at this point is larger in size than most of that found in the South but no crushing is done. The product is quite clean and no trouble is experienced with clay. William Heer, Jr., is superintendent.

J. A. Hanners, superintendent, Montgomery Gravel Co.

Dredge and pit of Montgomery Gravel Co.

Activities in the way of plant development in the state of Alabama are confined to the new slag plant of the Birmingham Slag Co. This is being rebuilt on the concrete bin supports that carried the old screening plant, recently destroyed by fire. The crushing plant was not damaged. The new structure is of steel throughout. The steel work is just about finished at this

Dredge of Gadsden Sand and Gravel Co., Gadsden, Ala.

writing. The Fairfield slag plant of the Birmingham Slag Co. continues to operate.

The Montgomery Gravel Co. built a new washer at Ireland Spur during 1930. This plant is of simple and compact design, using Niagara vibrating screens. This washer makes a total of three that the company now has. J. A. Hanners is superintendent of the operations.

At Denie, Ala., the Muscle Shoals White Lime Co., Inc., recently completed a hydrating plant using an Acme hydratnr made by Blaw-Knox Co. in conjunction with a Sturtevant mill and air separator. A 50-hp. Fairbanks-Morse "Y" type Diesel engine drives the hydrating, crushing and sacking equipment. A two-tube Bates packer is used in the new unit.

Lime Plants to Make Crushed Stone

In the lime producing section between Birmingham and Calera the five producing plants are operating at low capacity. At Saginaw, the Long View Lime Works is installing crushing equipment and a screening plant to enter the aggregate markets to dispose of spalls. The foundations for this unit are now being placed.

Natural Gas as Fuel for Lime Kilns

Some of the plants in the lime belt are equipped to burn natural gas, but because public opinion is adverse to the use of anything but Alabama coal, none of the operators visited is using natural gas. One company reported that with gas costing it 22 c. per 1000 cu. ft. with all of the kilns in operation, it was able to burn lime for 72 c. per bbl. With fewer kilns in operation the cost for fuel rose to 96 c. per bbl. Each kiln produces about 165 bbl. per day. The price of gas in the district is reported to be 16 c. per 1000 cu. ft. starting the first of April of this year.

The costs given per barrel when using gas for fuel are said to be considerably less than when coal is used. A greater tonnage per kiln can also be secured with natural gas, but gas is a disadvantage in this district, for when gas is burned a crew must be maintained at the plants on Sundays to attend to the drawing, but when coal or wood is used the kilns will hold over until Monday without drawing, thereby reducing labor costs.

Flux Stone and Marble Operations

South of Birmingham, at Scotrock, Ala., the Alabastine Stone Co. has started a small crushing and screening plant. The quarry produces a high calcium limestone primarily for furnace flux, with some road stone being produced from the finer sizes. The plant has a capacity of about 300 tons per day and has been in operation about a year. Geo. L. Scott is president and owner of the company, whose post office address is Silura, Ala.

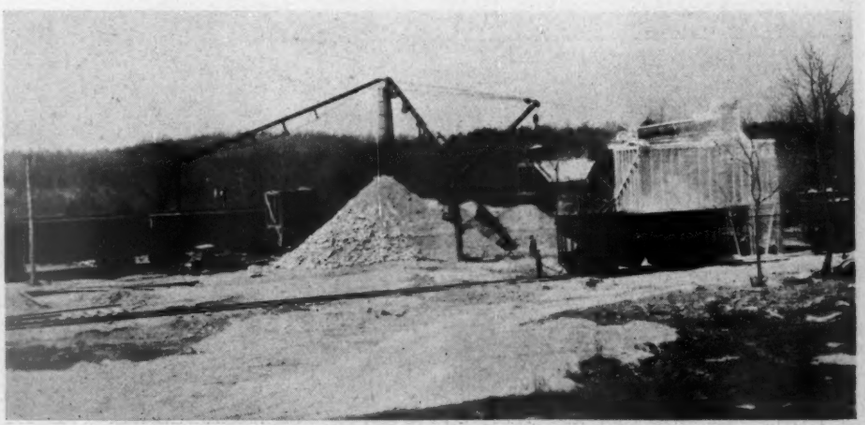
The Alabama Marble Co. at Gantt's Quarry, near Sylacauga, Ala., has a very extensive dimension and decorative marble quarry. The marble is pure white and the sawing and trimming plant compares favorably with any in the south.

Any defective blocks of marble are crushed for terrazzo in a small crushing plant, the product being screened over vibrating screens and sacked for shipments to all points in the United States. The company carries a stock of other than white terrazzo, having practically any color that the trade demands. The company recently added to its sales staff and expects to widen the scope of its sales of terrazzo products.

The finer material from this crushing plant is shipped to Cartersville, Ga., to the grinding plant of Thompson-Weinman and Co., Inc., which prepares whiting and other finely ground limestone products from the limestone dust.

Between Anniston and Gadsden, Ala., are two flux stone quarries, one operated by Charles M. Noble, which produces flux stone only, using hand labor entirely, and the operations of the East Quarry Co., at Glencoe. This company produces primarily a high calcium limestone for the steel mills in Birmingham and vicinity and has a small crushing plant as a part of the operations. Later, C. A. East, owner and general manager, expects to install some screening and crushing equipment for the production of commercial aggregates. Dan East is superintendent.

Kiln and hydrating plant of Muscle Shoals White Lime Co.



Plant of Alabastine Stone Co., Scotrock, Ala.

Northern Alabama Gravel Operations

At Gadsden,, Ala., the Gadsden Sand and Gravel Co. has been in operation two years. This plant has an 8-in. Amsco suction dredge equipped with a home-made cutter. Clay is quite a problem at this operation, but the superintendent, W. B. Wright, has developed a home-made high-speed log washer that is turning out a very clean product. The plant has a capacity of 150,000 tons of sand and gravel per year, about one-fourth of which is gravel. T. S. Griffin is general manager of this operation. The plant ships by truck as well as being on the rails of the L. and N. railroad.

At Sheffield, Ala., the Tennessee Valley Sand and Gravel Co. is the only active gravel and sand producer in the city. It has recently taken over the former Spruce Pine Sand and Gravel Co. and now operates that plant under the name of the Spruce Pine Sand Co. The Tennessee company uses a clamshell type dredge for taking its material from the Tennessee river. At Spruce Pine the material is recovered from a bank deposit. This deposit is gravel below which is a bed of high silica sand, roughly 20-ft. thick, which is the plant's princip l product. The sand washes out white and is suitable for molding sand, and parts of the deposit are suitable for glass sand.

The plant was built in 1920, using mostly Link-Belt equipment, which is driven by a 50-hp. Bessemer Diesel engine. A 50-hp. engine of the same type drives the clean water pump. These engines have proven very satisfactory as to fuel costs. The gravel contains some clay which has proven quite difficult to remove, so the company is confining most of its activities to sand production only. A. G. De Armen is superintendent.

Limestone crushing plant of U. S. Government at Russellville

New Quarry Competition Prevented by President Hoover

At Russellville, Ala., the limestone and quarry crushing plant part of U. S. Nitrate Plant No. 2 (Muscle Shoals) is still being kept up in first-class condition, although this plant has never operated since it was built in 1918-19. All the quarry equipment, shovels, etc., are stored in neat buildings; several acres of the quarry have been stripped ready for quarry operations, but this plant costing several hundred thousand dollars has never turned out a pound of limestone.

Quarry equipment of Russellville plant stored here

The plant is interesting in that it has as a primary breaker a set of Edison rolls. Secondary and finish crushers are all gyratory types. Most of the crushing equipment is Allis-Chalmers. The motors are all General Electric, every one of which is kept clean and orderly and it would only take a few days at most to get started.

The stone from this quarry as exposed on the surface is a high calcium oolitic limestone and resembles in appearance the limestone in the Ste. Genevieve district of Missouri.

If the recent bill passed by Congress but vetoed by President Hoover had become law this operation would have become one of the South's largest quarry operations; and incidentally one of the country's largest lime-manufacturing plants would have been operated in conjunction with it.

Quarry of U. S. Government, Russessville, Ala., was stripped but no rock removed

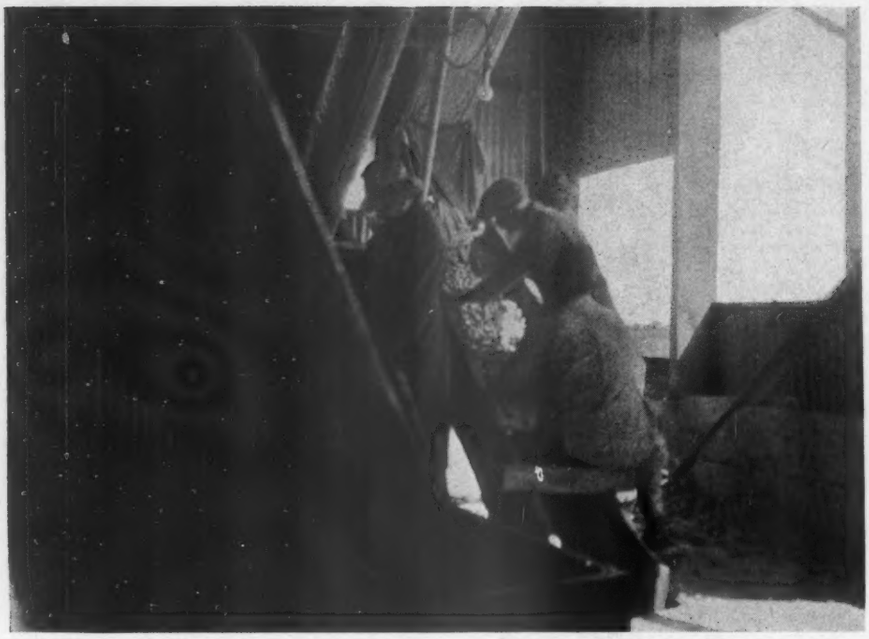
Rock Asphalt

The Dixie Minerals Corp. at Cherokee, Ala., hopes to start its asphaltic limerock operations shortly and has recently installed 6¼ miles of standard-gage track connecting the deposit with the plant. The company has also purchased a 55-ton steam locomotive and 14 Koppel cars of 12-yd. capacity. This old operation is being rehabilitated by Pittsburgh, Penn., capital. Later it is expected to spend around $25,000 on additional crushing equipment. J. T. Nealon is local manager of this company.

The Alabama Rock Asphalt Co., Inc., is also reported to be preparing to resume operations.

The Colbert Limerock Asphalt Co., at Colrock Spur, has been recently leased to Tyler Calhoun who expects to start operations shortly.

At Iuka, just over the Alabama line in

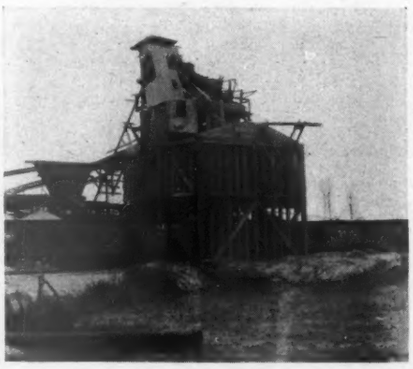


Sorting out clay balls at a sand and gravel operation

northern Mississippi, the Allen Gravel Co. which has been a shipper of gravel for the past 60 years, has just installed a No. 7 Allis-Chalmers Newhouse crusher, which is being used to crush the oversize from this unusual deposit.

At Iuka, the gravel contains some clay which is not removed but shipped with the gravel, and when this product is used for traffic-bound roads it sets somewhat giving a very serviceable roadbed. The material from the pit is blasted with light powder charges and screened to two sizes, a minus 1-in. size and a 1 to 2-in. size. The oversize up to the present has been allowed to accumulate at the waste dump. An enormous amount of this material is on hand and it is the intention of Sam H. Allen, general manager, to crush it to minus 5/8-in. Later he may install a magnetic device to remove tramp iron from this feed material.

From this section of the country large tonnages have been shipped, judging from the sizes of the various pits along the highways, of this natural cementing gravel, but the highway departments now prefer to use a washed material, adding the clay at the point of use, thereby saving on freight. This may mean that such producers of clay-bound gravels may have to install washing equipment with these operations if they are to continue.



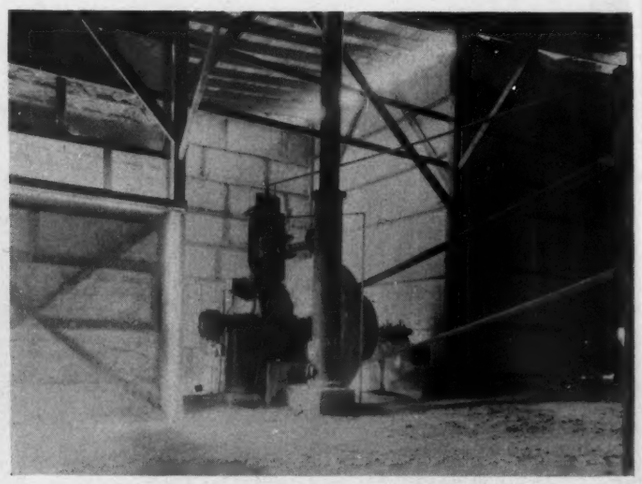
Southern Sand and Gravel Co., Columbus, Miss.

While the idea of shipping only washed gravel to the point of use and there adding the clay is all right in theory, there are many places in the south, particularly in the delta areas, where there is no clay, it having in the past been necessary to ship in some clay to act as additional binder for this type of traffic bound roads.

Five Gravel Operators at Columbus, Mississippi

In Columbus, Miss., district there are five gravel operators, the Columbus Gravel Co. being the largest. This company uses a 15-in. Diesel-engine driven suction dredge. A newer company in this district is the Southern Sand and Gravel Co. (same name as the operation at Selma, Ala.) which uses a 14-B Bucyrus dragline for stripping. The same equipment loads to a train of four Western 12-yd. dump cars, that delivers to the washing plant. All of the equipment in the washing plant is homemade and was designed by C. D. Griffin, vice-president of the company. This company is considering installing vibrating screens to improve the grading of the products. S. H. Livingston is president of the company.

Other operators in the district are the Kolola Gravel Co., New Hope Gravel Co. and the Waters and McCrary Gravel Co., all of Columbus, Miss. Some 40 miles north of Columbus are two gravel operations, the Amory Sand and Gravel Co. and the Amory Concrete Sand and Gravel Co., both of Amory, Miss. The plant of the Golden Sand and Gravel Co., near Golden, Miss., is not operating at present and it would take extensive overhauling to get the plant into operating condition. H. O. Hollingsworth is looking after the company's interests at Golden.



Hydrating plant of Muscle Shoals White Lime Co., with Diesel engine driving new hydrator

Nonmetallic Minerals Exceed Metals in Value in 1930

THE ESTIMATED total value of mineral products in the United States in 1930 was approximately $4,795,000,000, as announced by Scott Turner, Director of the United States Bureau of Mines, Department of Commerce. This is a drop of about 18% from the total value of mineral products in 1929.

Smaller Decline in Nonmetallics

Declines in values, accounted for both by lower unit prices and by the falling off in output of nearly all mineral products, are principally explained by the depression prevailing during the year in most lines of industrial activity. The total value of metallic products in 1930 decreased about 33%, as compared with 1929. Notable decreases in total values, ranging from approximately 25 to 50%, were recorded for copper, iron, silver, lead and zinc, but the value of gold production increased slightly.

The total value of the various nonmetallic mineral products in 1930 decreased only about 15% from the preceding year. Of the mineral fuels, the total value of natural gas increased, while the total values of bituminous coal, natural gasoline and petroleum recorded sharp declines.

The following figures give the estimated total value of metallic mineral products and nonmetallic products other than fuels and of mineral fuels produced in the United States in 1930:

ESTIMATED VALUE OF MINERAL PRODUCTS OF THE UNITED STATES, 1930

Metallic	$ 985,000,000
Nonmetallic (other than fuels)	1,028,000,000
Mineral fuels	2,782,000,000
Total	$4,795,000,000

Los Angeles County Finds Another Way to Limit Quarry Developments

A POLICY LIMITING the location of rock quarries in Los Angeles county in order to preserve areas that may possibly be used in the future for spreading grounds for the conservation of water has been adopted by the Board of Supervisors. The action was taken on the recommendation of E. C. Eaton, chief engineer of the flood-control district, who is now working on a comprehensive plan for flood control looking ahead for fifty years.

Spreading grounds already planned by the district include six acres at the mouth of San Gabriel canyon; three acres at Big Tujunga Canyon and 110 acres at the mouth of Pacoima canyon.

Digging deep excavations for rock quarries anywhere might seriously interfere with the county's future plan for flood control, Engineer Eaton informed the supervisors.—*Los Angeles* (Calif.) *Times.*

Barney Van Camp, Well-Known Stone Producer, Killed in Auto Accident

BARNEY T. VAN CAMP, aged 49, of Cincinnati, Ohio, brother of T. D. Van Camp, and president of the Van Camp Stone Co., Cincinnati, was killed in an auto accident March 28, near Eaton, Va.

His son, Ralph, who was accompanying him, was injured and is in Christ hospital, Cincinnati.

Mr. Van Camp was also president of the Van Camp Sand and Gravel Co. at Lebanon and had been prominent in business circles

Barney T. Van Camp

in Columbus and Cincinnati for 22 years. He was a member of the Hamilton Republican club and had served on the board of directors of the old Blaine club. He was also associated in business with former governor Myers Y. Cooper.

Surviving him also are his widow, Mrs. Stella Van Camp, and another son, Harold Van Camp.—*Columbus* (Ohio) *Dispatch.*

Asbestos Inquiry Ordered by United States Tariff Commission

THE UNITED STATES TARIFF COMMISSION has ordered an investigation of the sale and importation of Russian asbestos as a result of charge of unfair practices made by the Bear Canyon Asbestos Co., of Ambler, Pa., and the Regal Asbestos Mines, Inc., of New York City. This is the first investigation under Section 337 of the 1930 tariff act.

Bankrupt American Silica Corp. Reorganized

ALL THE ASSETS of the American Silica Corp., Ottawa, Ill., which went into voluntary bankruptcy several weeks ago and the Ottawa Sand Corp., have been purchased by a new corporation of New Jersey, which is known as the American Silica Sand Co. The company which was formed by the members of the bondholders committee of the American Silica Co., has taken over sand plants and sand lands in this district valued at approximately $1,500,000.

The new corporation has been financed, and is now ready to operate. Two crews of workmen are now repairing the company's plants near Ottawa and Utica. The main offices of the concern are in the Central Life building in Ottawa and the sales office will be in Chicago, Ill.

W. S. Walker, of Chicago, is president of the new corporation, C. J. Neisen of Ottawa is vice-president and general manager and Stewart S. Hawes, of Chicago, secretary and treasurer.

The new president was formerly a coal mine operator, and is a miner of proven ability. Of recent years he has been connected with some of the largest coal operations in Illinois as well as being identified with several large refractory companies. He has also been engaged in the industrial banking business in New York for twelve years.

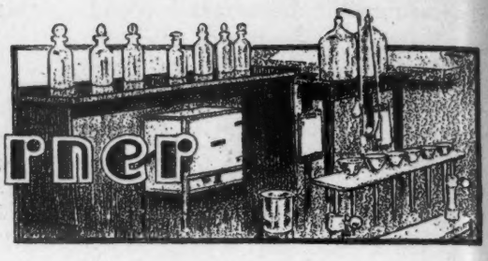
Mr. Neisen has been engaged in the sand business in LaSalle county twelve years, and is one of the best known industrial operators in this part of the state. He came to Ottawa in July, 1929, as manager of the American Silica Corp.—*Ottawa* (Ill.) *Times.*

Louisiana Quarry Co. Opens New Plant

AT 3:20 p. m., Saturday, April 4, O. K. Allen, chairman Louisiana Highway Commission, pressed a button at the new rock crushing plant of the Louisiana Quarry Co., five miles west of Winnfield, La., which officially set in motion the practically completed gigantic half-million dollar electrified plant which is to produce more than a million tons limestone concrete aggregate for Governor Huey P. Long's $68,000,000 road-paving program.

Witnessing this momentous event were officials of the Louisiana Quarry Co., Rutherford Snow Wilson, Sr., Little Rock, Ark., president; R. S. Wilson, Jr., general manager of operations here, both Mrs. Wilson, senior and junior; Asa Calire Butterworth, St. Louis, Mo., secretary-treasurer; J. M. Jenkins, plant superintendent; officials and engineers of the various manufacturing concerns furnishing and installing the plant; Mayor "Bill" Baker and members of the town council; many parish officials, newspaper representatives, motion and still picture photographers and interested citizens.—*Alexandria* (La.) *Daily Town Talk.*

The Chemists' Corner



Some Observations and Data in Connection With the Manufacture of Portland Cement from Raw Materials and Fuels High in Sulphur Content

By Alton J. Blank

General Superintendent and Supervising Chemist, Compania de Cemento Portland "Landa," S. A., Puebla, Puebla, Mexico

Abstract

THE AUTHOR recounts experience in the manufacture of cement with materials and fuels high in sulphur compounds resulting in sulphides in the clinker.

He comes to the conclusion that the sulphur present as a sulphide causes unsoundness in cements of a much more dangerous character than unsoundness caused by free lime.—The Editor.

THIS ARTICLE, in which the effect of the sulphur content of the fuel, raw materials and finished product is discussed, may serve as a reply to the closing paragraph of the article, "Accounting for Ignition Loss in Analyses of Clinker," by Katsuzo Koyanagi, in "The Chemists' Corner" of the August 16, 1930, issue of ROCK PRODUCTS, and to a second article by Mr. Koyanagi, "Effect of Sulphate vs. Sulphide in the Raw Material on the Strength of the Portland Cement," in the September 13, 1930, issue.

Without any attempt to discount the value of the data presented in the latter article by Mr. Koyanagi, and without attempting any discussion of the results obtained in this article, the reader may be reminded, however, that all data presented were derived from tests performed on a laboratory scale of experimentation.

The data and conclusions which are herewith presented by the writer have been taken from a number of years' experience on a cement plant scale of operations.

In the presentation of the results derived (at what shall be termed Plant No. 1), it may be of interest to describe the limestone quarry which, in the writer's opinion, is not only unusual from a cement manufacturing standpoint, but from a geological viewpoint as well.

This limestone quarry contained quite a variety of materials, a great number of which were unsuitable for raw materials of portland cement. Of a workable quarry face composing approximately 270,000 sq. ft., only 75% of the face contained usable limestone, the remainder consisting of a variety of undesirable materials. However, the most careful selection failed to omit all of these undesirable materials, and as a result small quantities were present in the limestone sent to the crushing department.

Above the limestone face were four cappings of foreign material, variable as to composition. The total thickness of these varied from several feet at one side of the quarry to 15 ft. at the other side. Material No. 1, which consisted of clay overburden, and continuing on to Material No. 4, which capped the limestone proper, were of the chemical compositions shown in Table 1.

In the semi-hard stone (Material No. 4) overlapping the limestone, a white ooze resembling hoar frost came to the surface, the composition of which was:

TABLE NO. 2—COMPOSITION OF OOZE

SiO_2	1.40%
Al_2O_3	0.94
Fe_2O_3	0.60
CaO	19.80
MgO	nil
SO_3	36.87
Loss	39.90

TABLE NO. 1—COMPOSITION OF QUARRY OVERBURDEN

	Material No. 1. Brown clay	Material No. 2. Soft white clay	Material No. 3. Semi-hard clay	Material No. 4. Semi-hard stone
SiO_2	66.60%	7.60%	5.60%	2.00%
Al_2O_3	17.58	11.88	2.80	1.20
Fe_2O_3	5.16	5.02	1.20	0.80
CaO	3.11	25.04	38.10	47.00
MgO	0.42	3.60	0.74	0.68
SO_3	Trace	34.30	26.41	16.12
Loss	7.00	12.20	25.10	31.80

In the limestone face proper there were a great number of non-communicating pockets of red clays, the average composition of which was:

TABLE NO. 3—COMPOSITION OF CLAY IN POCKETS

SiO_2	10.10%
Al_2O_3	30.15
Fe_2O_3	44.85
CaO	2.70
MgO	0.88
SO_3	trace
Loss	10.80

Present in these red clay pockets were reddish-tinted spars of crystallized gypsum, averaging as follows as to composition:

TABLE NO. 4—COMPOSITION OF GYPSUM CRYSTALS

SiO_2	1.20%
Al_2O_3	0.68
Fe_2O_3	2.92
$CaSO_4 \cdot 2H_2O$	89.88
$CaCO_3$	3.63
$MgCO_3$	0.75

Throughout the length of the limestone face were seams of clay varying as to thickness from several inches to several feet, the analyses of the two extremes being shown as follows:

TABLE NO. 5—COMPOSITION OF CLAY SEAMS

	White clay	Yellow clay
SiO_2	26.80%	50.80%
Al_2O_3	19.00	22.43
Fe_2O_3	2.14	5.37
CaO	25.75	3.70
MgO	0.96	0.82
SO_3	4.28	6.27
Loss	20.64	10.40

Contained in the seams of the yellow and white clays were spars of gypsum which analyzed as follows:

TABLE NO. 6—COMPOSITION OF GYPSUM SPARS

SiO_2	12.80%
Al_2O_3 and Fe_2O_3	7.40
$CaSO_4 \cdot 2H_2O$	42.74
$CaCO_3$	34.58
$MgCO_3$	1.96

Typical of the average limestone crushed monthly are the analyses in Table 7.

TABLE NO. 7—TYPICAL LIMESTONE ANALYSES

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
SiO_2	4.22%	3.84%	3.44%	2.50%	2.20%	2.06%	1.90%
Al_2O_3	2.10	1.58	1.96	1.10	1.02	0.88	0.86
Fe_2O_3	1.20	1.02	1.04	0.90	0.96	0.66	0.62
CaO	47.90	49.10	50.74	51.87	52.98	53.04	53.12
MgO	0.58	0.54	0.64	0.36	0.72	0.53	0.48
SO_3	1.79	1.44	1.30	0.96	0.75	0.47	0.38
Loss	41.40	41.60	40.00	41.70	41.00	42.10	43.30

The average sulphur trioxide content of the limestone, as taken over a period of several years, was 0.84%.

The average clay used in connection with the limestone in forming the raw mixture, though containing no trace of sulphur in its quarried state, upon being dried separately in oil-fired dryers, absorbed some sulphur as trioxide.

Typical of the average clay dried monthly are the following analyses:

TABLE NO. 8—ANALYSES OF CLAYS

	No. 1	No. 2	No. 3
SiO_2	42.10%	45.20%	48.14%
Al_2O_3	14.44	15.52	13.90
Fe_2O_3	5.26	5.08	4.60
CaO	13.63	10.75	11.88
MgO	3.62	5.06	4.66
SO_3	0.75	0.44	0.16

The average sulphur trioxide content of the dried clay, as taken over a period of several years, was 0.35%.

The average raw mixture, consisting of a mixture of from 2% to 6% of reclaimed fine dust, analyzed as in Table 9.

The average sulphur trioxide content of the kiln feed mixtures as taken over a period of several years, was 0.72%.

Typical analyses of the reclaimed flue dust are given in Table 10, and typical analyses of clinker in Table 11.

The average sulphur trioxide content of the clinker, as taken over a period of several years, was 0.75%, of which a part was quite often present as sulphur (sulphide), this depending on kiln operating conditions.

Incidentally, the sulphur content of the fuel oil burned in the kilns ranged between 4 and 7% S.

The average cement as produced over a similar period contained 1.96% of sulphur trioxide; thus an average of 1.21% of sulphur trioxide as gypsum was added.

The cement as manufactured at the plant in question had little margin for soundness, and ofttimes when unsound cement was made, free lime determinations failed to show underburning or an excess of lime to be the cause. Cements of this nature, on being subjected to the boiling test, were on many occasions found to have expanded to twice the original size of the cement test pat, while the color of the pats was usually found to be bluish-green. Similarly, this type of cement was always found to yield high expansion when determined by the Le Chatelier method. The tensile strength of 1:3 mortar briquettes was considerably below the average at ages up to 28 days, while retrogression after 28 days was rapid.

Filter paper dipped into a solution of silver chloride, when held over a beaker containing cement made to effervesce through agitation with hydrochloric acid solution, was found to turn black when cements of this nature were utilized, thus showing the presence of sulphur as sulphide. Analyses of a number of these cements showed high sulphur (sulphide) contents to be present. Admixtures of various sulphides in the chemically pure form to cements free from sulphides showed that those cement pats containing calcium sulphide turned bluish as to color when exposed to the boiling test, thus accounting for the bluish color found in those cements the soundness of which could not be traced to underburning or excessive percentages of calcium oxide. Calculations made from analyses performed upon a number of these cements showed the calcium sulphide content to average 0.30%. Several hundreds of tests made upon cements containing sulphides led to the conclusion that calcium sulphide (though possibly other forms of sulphides contributed) was the chief cause for unsoundness and low strengths received with correctly proportioned, well-burned cements.

On a number of occasions, due to excessive quantities of flue dust present in the raw mixtures fed the kilns, freak cements were produced with sulphur trioxide contents of an extremely high nature being present. Cements of this nature, though usually sound, yielded good strengths only when test pieces were stored in air, since those test pieces stored in the moist closet, or in water for a period of over 24 hours, were found to completely disintegrate, this being particularly true of those cements containing in excess of 10% SO_3. Cements containing 2 to 3% of SO_3, while yielding normal strengths up to ages of 28 days, were found to show later retrogression.

Studies made of kiln operating conditions with materials high in sulphur content showed the materials to be extremely hard to combine in the kiln, resulting in high fuel consumption and low kiln outputs. Observations, together with a great number of chemical analyses made on "ring formations," showed that the sulphur content of raw cement mixtures (possibly aided by the absorption of fuel sulphur) is a contributing factor in the formation of rings in the rotary cement kiln. Observations and tests performed at one other plant confirm this conclusion. Similarly, raw mixtures high in sulphur content have been found to account to a great extent for the excessive thickness of the coating found on the brick in the burning zones of a number of kilns.

As has been shown by the writer in other articles; raw cement mixtures free of sulphur in any of its forms may absorb sulphur from the fuel in their passage through the kiln. The absorption of sulphur from the fuel, while greater when an oxidizing atmosphere is had in the kiln, is still had to some extent with reducing atmospheres.

A great number of experiments made by the writer have invariably shown that the better cement is mnufactured with the oxidizing flame, since the reduction of either the sulphur or iron compounds in the cement results in an inferior product.

In conclusion the writer (borrowing a statement from one of his previous articles on the sulphur question), maintains that "unsoundness in portland cement caused by sulphur (sulphides) is a more dangerous factor than that caused by free lime or underburning, or due to over-limed mixtures."

TABLE NO. 9—TYPICAL RAW MIXTURE ANALYSES

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
SiO_2	13.80%	13.20%	14.10%	13.84%	13.40%	13.18%
Al_2O_3	5.11	5.06	5.20	5.06	5.28	5.12
Fe_2O_3	1.73	1.44	2.00	2.04	1.72	1.94
CaO	42.50	42.68	42.04	42.60	42.29	42.61
MgO	1.48	1.59	1.68	1.66	1.74	1.70
SO_3	1.54	1.23	1.02	0.89	0.68	0.41
Loss	33.22	33.86	33.54	34.10	34.30	34.10

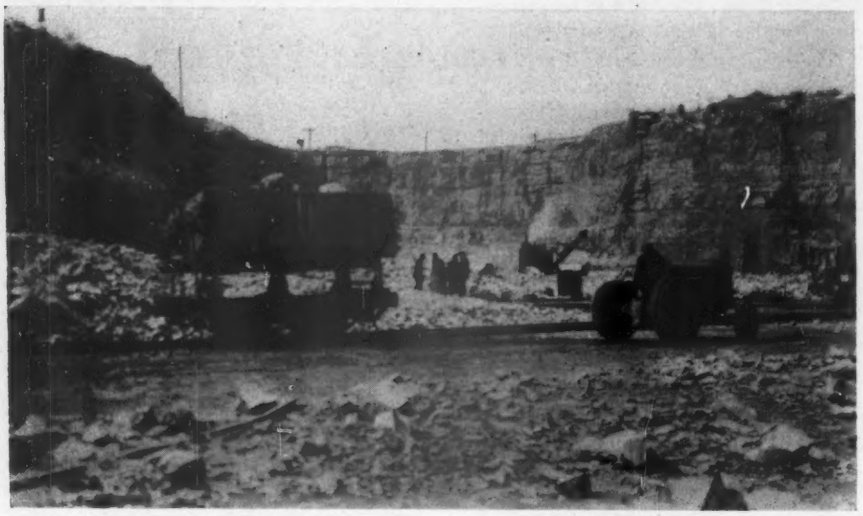
TABLE NO. 10—TYPICAL FLUE DUST ANALYSES

	No. 1	No. 2	No. 3	No. 4	No. 5
SiO_2	14.40%	12.32%	11.06%	9.80%	11.82%
Al_2O_3	4.90	3.82	3.24	2.66	4.28
Fe_2O_3	2.02	1.66	1.42	1.30	1.64
CaO	52.22	47.38	45.19	40.86	41.84
MgO	1.62	1.44	1.41	1.23	1.37
SO_3	12.44	18.27	24.71	31.28	14.77
Loss	4.24	6.40	4.70	7.70	12.60
Alkalies, etc.	8.16	8.71	8.24	5.17	11.68

TABLE NO. 11—TYPICAL CLINKER ANALYSES

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
SiO_2	21.58%	20.66%	21.04%	20.76%	21.00%	20.90%	21.00%
Al_2O_3	7.44	7.17	7.25	7.31	7.45	7.66	7.12
Fe_2O_3	2.86	3.09	3.19	2.69	3.05	2.94	3.18
CaO	64.10	64.15	64.48	64.24	64.54	64.66	64.57
MgO	2.22	2.24	2.24	2.22	2.17	2.19	2.17
SO_3	0.99	0.92	0.72	0.88	0.78	0.68	0.63
Loss	0.44	0.42	0.40	0.58	0.40	0.40	0.48

Hints and Helps for Superintendents



Tractor spots quarry cars with wire rope

Car Spotter in a Kentucky Quarry

THE Kentucky Consolidated Stone Co. operates 11 plants throughout the Blue Grass state, one of the largest operations being at High Bridge, Ky. This is a pit operation with about a 95-ft. face, using two shovels, one a ¾-yd. Erie and the other a 1½-yd. Marion, each served by an independent track taking off from the foot of the incline to the plant. The full and empty, 6-yd. Western dump cars are spotted at the foot of the incline, or at the loading shovels, by a Fordson tractor using a small diameter wire cable to connect the tractor to the cars. This arrangement simplifies the switching.

Cement Conveyor Kink for Ready-Mix Plant

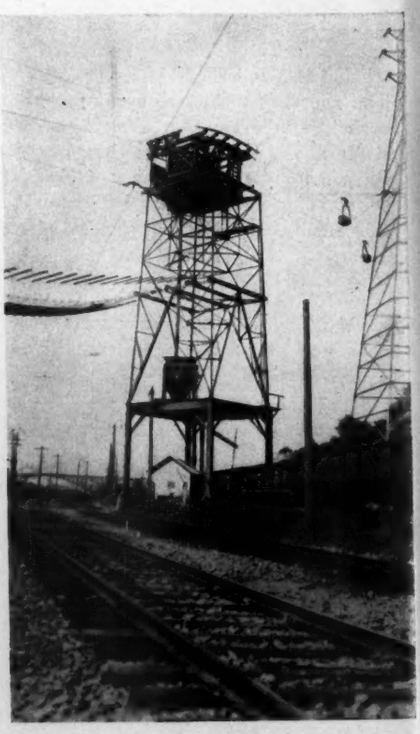
THE Ross Island Sand and Gravel Co., Portland, Ore., operates a ready-mixed concrete plant. The sand and gravel for the concrete is drawn to the weighing hopper by gravity and discharges to the mixer. Sacked cement is dumped to a short screw conveyor that elevates the cement and discharges also to the mixer.

To assist the operation steel bars have been placed across the cement hopper serving the screw conveyor, so the warehouse man can pile on these bars the number of sacks of cement called for by the mixer operator. Later, as desired, the sacks are dumped. The channel iron grids not only act as a handy means of dumping the sacks but eliminate the possibility of a full sack falling into the conveyor. It also, of course, is a guard for the man dumping the sacks.

Bars across hopper feeding cement screw conveyor

Aerial Tram Car Loader

THE AERIAL TRAM of the Ross Island Sand and Gravel Co., near Portland, Ore., is used to deliver material to their bunkers located on the bluffs overlooking the Willamette River. The rails of the Portland Electric Power Co. pass below the distributing bunkers and gondola railway cars used for making shipments are filled



Aerial guard protects right-of-way

from a special tower near the tracks which supports the tramway.

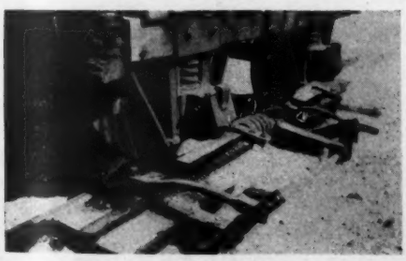
As the filled buckets pass this tower they automatically trip and discharge to a small bin from which the sand or gravel is chuted to the car. The fall is about 90 ft. The main line tracks are protected from falling stone by a blanket of wood and wire supported from this tower and its adjacent one. By the use of this arrangement the company is able to make shipments from the plant by all commercial carriers; by rail, water or truck.

Effective Way of Stripping Cars at Foot of Incline

A UNIQUE ARRANGEMENT has been in use at the Thornton quarry of the Moulding-Brownell Co. for some years. It consists of a lever actuated car stop for the

Style of strap-iron car stop

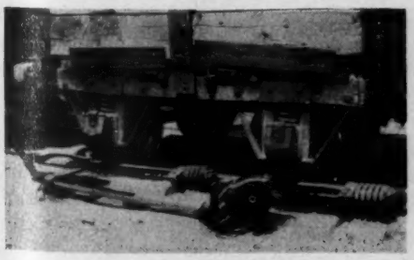
foot of the incline to the primary crusher, which stops the returning empty cars at a predetermined point, with no appreciable jar to shorten the life of the cars. It is so



Lever actuates car stop

arranged that no part of the car or truck is under undue strain at the point of stopping.

The accompanying photographs show both sides of the stop. The first picture shows



Coil springs absorb shock

clearly the arrangement of strap iron triangles which are flush with the track, and in position rest upon it. These are set to engage both the front and rear wheel on the one side of the track.

The stop is operated from the opposite side of the track by a lever (shown in the second illustration). When the lever is thrown toward the track, the triangular stops are pushed from the track about 3 in., disengaging the car wheels, and permitting the car to roll by gravity away from the incline, to make way for the next descending car.

Coil springs are placed on rods connecting the two triangular stops, parallel to the track, in such a way that practically all shock is taken up by the springs and not by the mechanism itself. It is claimed that this mechanism has been in use at the foot of both inclines of the company for a number of years, and has given complete satisfaction.

Pit for Loading Concrete Pipe

LOADING CONCRETE PIPE at a concrete products plant is usually a tedious job and one in which considerable breakage is likely to occur. The Nelson Concrete Pipe Co., Champaign, Ill., has devised an unusual loading arrangement at its plant which eliminates the lifting of the pipe entirely. An excavation was made about 4 ft. deep, 9 ft. wide and 25 or 30 ft. long, with one end sloping up to the ground level. A concrete floor was laid in this and the sides were completed with concrete block from the plant. This pit is just deep enough so that the floor of a delivery truck in the pit comes up to the ground level. The pipe can thus be rolled on to the truck with no lifting, and with a minimum danger of breakage. Some arrangement must be made for draining the pit to lower ground or to a nearby sewer.

Pit loading concrete pipe saves breakage

Hot Pit Guards

EMPTYING the hot stucco from the hot pits in a gypsum plant used to be done by the operator simply hoeing the hot stucco out by hand into a suitable screw type conveyor. Present methods consist usually of some variation in the use of a series of short, small diameter screw conveyors that rest on the bottom of the pit and deliver to the master conveyor. As these small feeder conveyors are all driven from one shaft through a series of miter-and-pinion gears the installation, unless properly protected, is an industrial hazard.

The photograph shows how one western gypsum producer protected the workman from this hazard at the hot pit gears by means of wire cloth guards so hinged at the back that the guard can be raised for inspection of gears and shifting mechanism.

Wire cloth protects workmen at hot pit

Crossroads of Industry

An Editorial in *Engineering News-Record* on a Matter of Present Vital Concern

CURRENT happenings give warning that industry is approaching a parting of the ways. Under the stress of business conditions some important industries are considering the abandonment of their hardly achieved group co-operation. Upon the decision hang issues of great magnitude; not only may these particular industries lose heavily but the sound course of industry as a whole is placed in jeopardy.

Two great industries, which over a period of years had developed well-planned and efficient co-operation through industrial or trade associations, are being led by bitter competition and internal realignments to deprive these associations of support, so that they are likely to wither into uselessness. There are indications that several other industries are nearing a similar crisis. The superficial causes of this development merely mask the fundamental cause—lack of adequate faith in the purposes of co-operation and lack of stamina to persevere against the pressure of strenuous times. What this new course will mean to industry is not hard to see.

For fifteen years or more industry has been learning that co-operation is the foundation stone of its stability and progress. It found that no single enterprise, however large or self-sufficient, can stand aloof from related enterprises. The welfare of the entire field is closely bound together. Consistently this experience became more emphatic as the forces of competition between rival industries grew more intense and as relations to government and to the public assumed greater importance. Out of it there evolved that modern tool of co-operation, the trade association. This tool has long since demonstrated its essential value, yet has only begun to take its rightful place in industrial life.

In guarding the interests of its industry in relation to other industries, government and public, the industrial association has carried out many important functions. *First,* it carries on promotion, or public education; *second,* it engages in technical development through research; *third,* it acts as central committee for standardization and simplification; *fourth,* it harmonizes conflicting or ill-adjusted business relations with suppliers and clients as well as among members; and *fifth,* it is the voice of the industry to public and government.

A long account would be needed to tell even in outline what such associations have accomplished by developing sound trade practices, by creating better technological methods, by developing new fields of use, by simplifying product, by fostering cost study and commercial stability, and by promoting open understanding of the industry's concerns with the public. Were merely the results of their research brought together, a fascinating story would appear. Yet it appears that these things, though well known to all industrial men, are in danger of being forgotten at the very time when they deserve to be most gratefully remembered. If such services are valuable in normal or prosperious times, they acquire a truly critical importance in times of severe pressure, for co-operation is more needed during stress and readjustment than it is when matters are going smoothly.

Beyond the present achievements of industrial associations lies the pregnant fact that these organizations have been the one great bulwark of industry against extensive governmental regulation and control. After the war there never was a time when any one industry stood so isolated from the commonwealth that its business was wholly its own concern. From railroads to wheat farmers, from cotton spinners to coal producers, all fields of industry were seen to be so clearly endowed with a public interest that their operations at all times were the direct concern of everyone. The public has come to believe that for its own security it must be assured of sound conditions within an industry, and that unless a competent spokesman can give such assurance governmental supervision will be necessary. The industrial association has begun to play the part of that spokesman, and its advance in this direction has been the most promising element of industrial relations in recent times. It may not prove to be a final or adequate agency to safeguard these relations, but it is the most efficient yet created.

On these facts rests the importance of industrial association work to industry as a whole. And because of these facts it is a matter of wide concern that leading industries, which have shown the way to effective development of co-operation, should weaken in their adherence to the system which they built and should allow their own co-operative work to become devitalized. Profound repercussion of such action on industrial co-operation in other fields is certain. Discouragement is notoriously infectious, more particularly under present conditions, and the bad example of one or two notable defections from the practice of co-operation will not remain without followers. Thus, industry as a whole is affected by the threatened events.

That managerial tempers should become short and impatient under the stress of difficult business is not remarkable. But it is startling to realize that this impatience can cause responsible executives to lose a sense of due appreciation of what they built up in long uphill labor and to court the loss of present service and future promise in co-operative work. For the industries directly concerned such a result means an immediate loss. Its effect on other industry, though less direct, may ultimately be even greater.

These developments call for sober thought. Each element of the industries concerned has reason to consider carefully the course to be taken. Is it prepared to go into a future built on the old-time basis of every-one for himself? Is it willing to suffer the loss of an aid that has been of fundamental value to its industry? Can it permit a single year's pressure to break down an essential service agency, one intimately bound up with industrial self-reliance and independence?

And so, also, every other industry faces the question of whether its own co-operative work is being placed in danger. Outstanding in the situation is the certainty that every industry faces the alternative of self-government or imposed government. Unless capable industrial associations are at hand to take leadership in self-regulation, extension of regulation and control by the public will be inevitable.

Our Endorsement

THIS IS a splendidly written comment, very pertinent to at least one rock products industry. It should be read and absorbed by every rock products producer.

Rock Products feels that it has a vital interest in preserving and building up the associations of producers in its field. Its own future prosperity depends on the exercise of every effort on the part of every producer, individually and collectively, to hold fast to that which he has and to go forth with a stout heart for all that he can honestly get.

These may or may not be "times that try men's souls"; but they certainly are times that try their patience and fortitude. Because one, two, three or a score of producers refuse to play fair is no excuse for a general rough-and-tumble melee.

The accompanying comment is of especial interest and value because it represents the views of the engineer user in regard to association activities.—The Editor.

Editorial Comment

Whither Bound?

The cement industry needs friends. No other industry we know of suffers so much from such persistent and consistent derogatory "news" and newspaper editorials, largely inspired we believe by a lack of understanding of, and sympathy for, the peculiar problems of the industry. These problems are made difficult because a large part of the industry's output is sold directly or indirectly for public works; and there is no masking the fact that politics, so-called, are involved.

There is a considerable element in the industry which looks upon this price-cutting spree as a private war, to be settled privately. It shouldn't be. Nowadays managers of industry have other things to consider besides private grudges—and these include not merely the interests of their employes and stockholders, but the public interest. Nor are public works officials really serving the public interest by encouraging and abetting these price wars—the cost of which eventually comes out of the public many times over.

The suggestion made in the editorial in these pages, March 28, that there be a national conference on public works policy to develop a code of principles, which it was hoped would recognize the economic necessity for commodity price maintenance and stability as well as stability of wages for construction labor, already recognized, was made because we believe such a conference would win friends and understanding and sympathy for construction material producers.

The editor has received various and interesting reactions to this suggestion, which we will not attempt at this time to present, analyze or comment on. We shall do so in another issue. In the meantime we respectfully suggest further consideration of the idea. For one we are not willing to accept a do-nothing policy as the only solution of the present problems of our industries.

Uniformity in Aggregates

Recent federal aggregate specifications contain a uniformity clause in the specification for fine aggregate. The limits of grading given are broad enough to satisfy anybody but the uniformity clause makes them rigid as regards any particular product. For the producer is required to submit a sample with his bid and shipments that follow must come within 20 points either side of the fineness modulus of the sample. If the sample has a fineness modulus of 3.00 the shipments must have fineness moduli between 2.80 and 3.20.

On the face of it this specification should be easy to fulfill yet there are many producers who will find it difficult. Deposits of sand usually vary more than the tolerance permitted. It is possible to separate and recombine to an even closer uniformity than the specification requires but the question of waste and lowered tonnage comes in. Such a specification is not going to be popular with producers except those who are already making what is sometimes called "prescription sand" and who count on such a clause to keep competition out of their market.

Nevertheless, the trend of things is such that uniformity is bound to be demanded more and more by the users of concrete materials. Earlier methods of proportioning, such as making 1:2:4 and 1:2:3½ mixes, are rapidly giving place to adapting proportions of fine and coarse aggregate to a given water-cement ratio. The quantity of water and the proportions being fixed, workability and yield are largely matters of gradation, especially gradation of the fine aggregate. Anyone who has ever seen the concrete "stiffen up" in the mixer because the sand was running fine can appreciate this. In practice the proportions are worked out by trial practice on samples submitted by the producer. But if the samples are not representative the proportions found by trial mean little or nothing. From the consumer's point of view the insistence on uniformity does not appear so unreasonable, especially where he has to use a fixed quantity of water.

Some progressive producers have already sensed that a uniformity requirement may be generally adopted and are prepared to meet it. One of the largest and best designed sand and gravel plants that has been erected in recent years has its sand recovery plant built around this idea. The bank sand is separated into coarse, medium and fine sands and these are recombined on a belt conveyor in the proportions needed to give the required fineness modulus. Stocks may accumulate for a time of any one of these, but the law of averages will work so that the whole product will finally be sold, less a certain amount that would have to be wasted anyway, or sold to another market than that for concrete sand. An engineer on the Pacific Coast who has had much experience in highway work now specializes in advising plants how to produce uniform materials. The popularity of aggregates in separate sizes instead of mixtures of sizes largely comes from its insurance of uniformity. And almost every book or magazine article that has to do with the practical side of concrete making has something in it that shows the extreme desirability of uniformity in concrete aggregates.

So while it is not desirable to add a burden to producers of aggregate who have already plenty of troubles to bear it is just as well to recognize and point out the trend that the demand of the market is taking. In a strong buyer's market (and every market seems to be a buyer's market these days) the seller who comes the nearest to furnishing the ideal material gets the cream of the business. And in the case of aggregates this is the producer who can guarantee to maintain the uniformity of his product within reasonable limits.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	3-26-31	88	.....	
Alpha P. C. new com.[2]	4- 4-31	15¼	15½	25c qu. Apr. 25
Alpha P. C. pfd.[2]	4- 4-31	115	120	1.75 qu. Mar. 14
Amalgamated Phosphate Co. 6's 1936[19]	4- 6-31	99½	100½	
American Aggregates com.[10]	4- 6-31	5	10	75c qu. Mar. 1
American Aggregates pfd.[10]	4- 6-31	75	85	1.75 qu. Apr. 1
American Aggr. 6's w.w.[19]	4- 6-31	73⅛	77	
American Aggr. 6's ex. w.[19]	4- 6-31	71⅛	75	
American Brick Co., sand-lime brick	10- 6-30	4½	.....	25c qu. Feb. 1, '30
American Brick Co. pfd.	4- 6-31	60	.....	50c qu. May 1, '30
Am. L. & S. 1st 7's[19]	4- 6-31	95	98	
American SilicaCorp. 6½'s[30]	4- 8-31	No market		
Arundel Corp. new com.	4- 8-31	39¾	.....	75c qu. Apr. 1
Beaver P. C. 1st 7's[20]	4- 4-31	95	.....	
Bessemer L. & C. Cl. A	4- 7-31	31	.....	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	3-21-31	88	90	
Bloomington Limestone 6's[27]	3-26-31	50	52	
Boston S. & G. new com.[37]	4- 4-31	11½	15	30c qu. Apr. 1
Boston S. & G. new 7% pfd.[37]	4- 4-31	41	45	87½c qu. Apr. 1
California Art Tile A	4- 2-31	.....	5½	43¾c qu. Mar. 31
California Art Tile B[40]	4- 2-31	.....	5	20c qu. Mar. 31
Calaveras Cement com.	4- 2-31	.....	12	
Calaveras Cement 7% pfd.	4- 2-31	.....	80	1.75 qu. Apr. 15
Canada Cement com.	4- 7-31	16⅜	16⅞	
Canada Cement pfd.	4- 7-31	95¼	95½	1.62½ qu. Mar. 31
Canada Cement 5½'s[34]	4- 7-31	102	102¾	
Canada Cr. St. Corp. bonds[34]	4- 7-31	93	97	
Certainteed Prod. com.	4- 7-31	6	6½	
Certainteed Prod. pfd.	4- 7-31	20½	27⅛	1.75 qu. Jan. 1
Cleveland Quarries	4- 7-31	.....	65	75c qu. 25c ex. Mar. 1
Columbia S. & G. pfd.	4- 6-31	93½	95½	
Consol. Cement 1st 6½'s, A[44]	4- 8-31	No market		
Consol. Cement 6½% notes[23]	4- 8-31	25	.....	
Consol. Cement pfd.[27]	3-26-31	10	20	
Consol. Oka S. & G. 6½'s[32] (Canada)	4- 4-31	99	101	
Consol. Rock Prod. com.[9]	4- 2-31	75c	1	
Consol. Rock Prod. pfd.[9]	4- 2-31	3½	4	43¾c qu.June 1'30
Consol. Rock Prod. units	4 -6-31	10	11	
Consol. S. & G. pfd. (Can.)	4- 7-31	.....	75	1.75 qu. Feb. 16
Construction Mat. com.	4- 7-31	7½	8½	
Construction Mat. pfd.	4- 7-31	27	27½	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	3-18-31	75	80	
Coosa P. C.1st 6's[27]	3-26-31	45	55	
Coplay Cem. Mfg. 1st 6's[33]	4- 4-31	95	.....	
Coplay Cem. Mfg. com.[33]	4- 4-31	5	7½	
Coplay Cem.Mfg. pfd.[33]	4- 4-31	25	40	
Dolese & Shepard	4- 7-31	50	55	$1 Apr. 1
Dufferin Pav. & Cr. Stone com.	4- 7-31	.....	11	
Dufferin Pav. & Cr. Stone pfd.	4- 7-31	76	77	1.75 qu. Apr. 1
Edison P. C. com.[32]	4- 4-31	50c	.....	
Edison P. C. pfd.[32]	4- 4-31	2½	.....	
Federal P. C. 6½'s, 1941[19]	4- 6-31	96	100	
Giant P. C. com.[2]	4- 4-31	2	5	
Giant P. C. pfd.[2]	4- 4-31	15	25	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	4- 7-31	9	9⅛	20c qu. Apr. 1
Hermitage Cement com.[21]	4- 4-31	15	25	
Hermitage Cement pfd.[21]	4- 4-31	75	85	
Ideal Cement, new com.	4- 7-31	46	48	75c qu. Mar. 31
Ideal Cement 5's, 1943[29]	3-23-31	97	100	
Indiana Limestone units[27]	3-26-31	No market		
Indiana Limestone 6's	4- 7-31	55	.....	
International Cem. com.	4- 7-31	43	43¾	$1 qu. Mar. 31
International Cem. bonds 5's	4- 7-31	95¼	95¾	Semi-ann. int.
Iron City S. & G. bonds 6's[36]	4- 6-31	88	92	
Kelley Is. L. & T. new stock	4- 7-31	26	33½	62½c qu. Apr. 1
Ky. Cons. St. com. V. T. C.[38]	3-23-31	5	8	
Ky. Cons. Stone 6½'s	4- 6-31	87	89	
Ky. Cons. Stone com.	4- 6-31	5	6¾	
Ky. Cons. Stone pfd.	4- 6-31	75	85	1.75 qu. Feb. 1
Ky. Rock Asphalt com.[11]	4- 4-31	5	7	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	4- 4-31	75	79	1.75 qu. Mar. 1
Ky. Rock Asphalt 6½'s[31]	4- 4-31	80	90	
Lawrence P. C.[2]	4- 4-31	54	58	$1 qu. Mar. 31
Lawrence P. C. 5½'s, 1942[2]	4- 4-31	87	89	
Lehigh P. C.	4- 7-31	14	16	25c qu. May 1
Lehigh P. C. pfd.	4- 7-31	100⅛	100½	1.75 qu. Apr. 1
Louisville Cement[7]	4- 2-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	4- 4-31	98	.....	
Lyman-Richey 1st 6's, 1935[13]	4- 4-31	98	.....	
Marblehead Lime 6's[14]	4- 3-31	75	85	
Marbelite Corp. com. (cement products)	4- 4-31	75c	.....	
Marbelite Corp. pfd.	4- 4-31	4	.....	50c qu. Oct. 10,'30
Material Service Corp.	4- 8-31	22	28	50c qu. Mar. 1
McCrady-Rodgers 7% pfd.[22]	4- 2-31	45	48	87½c qu. Mar. 30
McCrady-Rodgers com.[22]	4- 2-31	15	21	75c Jan. 26
Medusa Portland Cement	4- 7-31	.....	65	75c qu. Apr. 1
Michigan L. & C. com.[6]	4- 4-31	45	.....	
Missouri P. C.	4- 7-31	25½	26	50c qu. Jan. 31
Monolith Portland Midwest[9]	4- 2-31	1¾	2½	
Monolith P. C. com.[9]	4- 2-31	3	4	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	4- 2-31	4	5	40c s.-a. Jan. 1
Monolith P. C. units[9]	4- 2-31	10	12	
National Cem. (Can.) 1st 7's[34]	4- 7-31	99½	.....	
National Gypsum A com.	4- 7-31	5	5¾	
National Gypsum pfd.	4- 7-31	42	44	$1 Apr. 1
Nazareth Cement com.[25]	2-21-31	15	.....	
Nazareth Cement pfd.[25]	2-21-31	98	.....	
Newaygo P. C. 1st 6½'s[27]	3-26-31	100¾	101½	
New England Lime 1st 6's[14]	4- 3-31	50	60	
N. Y. Trap Rock 1st 6's	4- 6-31	100	100¼	
N. Y. Trap Rock 7% pfd.[30]	3- 7-31	95	.....	1.75 qu. Apr. 1
North Amer. Cem. 1st 6½'s	4- 6-31	49	49½	
North Amer. Cem. com[27]	3-26-31	2	3	
North Amer. Cem. 7% pfd.[27]	3-26-31	18	21	
North Shore Mat. 1st 5's[15]	4- 8-31	92	.....	
Northwestern States P. C.[31]	4- 4-31	105	120	$2 Apr. 1
Ohio River Sand com.	4- 6-31	.....	14	
Ohio River Sand 7% pfd.	4- 6-31	.....	98	
Ohio River S. & G. 6's[36]	4- 4-31	85	90	
Oregon P. C. com.[20]	4- 4-31	9	13	
Oregon P. C. pfd.[20]	4- 4-31	87	90	
Pacific CoastAggr. com.[40]	4- 2-31	1	2	
Pacific Coast Aggregates pfd.	4- 6-31	2½	4	
Pacific Coast Cement 6's[5]	4- 2-31	65½	75	
Pacific P. C., new com.	4- 2-31	12	.....	
Pacific P. C., new pfd.	4- 2-31	70⅛	75	1.62½ qu. Apr. 4
Pacific P. C. 6's[5]	4- 2-31	97½	99	
Peerless Cement com.[1]	4- 4-31	2	3½	
Peerless Cement pfd.[1]	4- 4-31	65	70	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	4- 7-31	4⅛	4¼	
Penn.-Dixie Cement pfd.	4- 7-31	18	23	
Penn.-Dixie Cement 6's	4- 7-31	67	68	
Penn. Glass Sand Corp. 6's	3- 4-31	101	103	
Penn. Glass Sand Corp. pfd.	2- 4-31	90	.....	1.75 qu. Apr. 1
Petoskey P. C.	4- 7-31	6½	7½	15c qu. Apr. 1
Port Stockton Cem. com.[9]	4- 2-31	No market		
Riverside Cement com.	4- 2-31	10	12	
Riverside Cement pfd.[20]	4- 4-31	65	68	1.50 qu. Feb. 1
Riverside Cement, A[20]	4- 4-31	10	12	15c qu. Feb. 1
Riverside Cement, B[9]	4- 4-31	1½	2	
Roquemore Gravel 6½'s[17]	4- 6-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	4- 6-31	91	100	
Santa Cruz P. C. com.	4- 2-31	84	.....	$1 qu. Apr. 1
Schumacher Wallboard com.	4- 2-31	8	11	25c qu. Mar. 27
Schumacher Wallboard pfd.	4- 2-31	19	23½	50c qu. May 15
Southwestern P. C. units[35]	3-18-31	225	275	
Standard Paving & Mat. (Canada) com.	4- 7-31	13	14	50c qu. Feb. 16
Standard Paving & Mat. pfd.	4- 7-31	.....	77	1.75 qu. Feb. 16
Superior P. C., A	4- 2-31	35½	37½	27½c mo. May 1
Superior P. C., B	4- 2-31	11	13	25c qu. Mar. 20
Trinity P. C.units[21]	4- 4-31	115	130	
Trinity P. C. com.[21]	4- 4-31	32	50	
Trinity P. C. pfd.[27]	3-11-31	107	110	
U. S. Gypsum com.	4- 7-31	45½	46½	40c qu. Mar. 31
U. S. Gypsum pfd.	4- 7-31	127⅝	.....	1.75 qu. Mar. 31
Wabash P. C.[21]	3-23-31	18	23	
Warner Co. com.[16]	4- 4-31	29	31	50c qu. Apr. 15
Warner Co. 1st 7% pfd.[16]	4- 4-31	97	101	1.75 Apr. 1
Warner Co. 1st 6's w.w.	4- 7-31	95	95½	
Whitehall Cem. Mfg. com.[30]	3- 7-31	80	.....	
Whitehall Cem. Mfg. pfd.[30]	3- 7-31	50	.....	
Wisconsin L. & C. 1st 6's[15]	4- 8-31	92	.....	
Wolverine P. C. com.	4- 7-31	.....	3½	15c qu. Nov. 15
Yosemite P. C., A com.[9]	4- 2-31	2	2½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]Hemphill, Noyes & Co., New York City. [42]Nesbitt, Thomas & Co., Montreal. [43]Foreman State-National Bank, Chicago. [44]E. H. Rollins, Chicago.

Balance Sheet of the Arundel Corp.

THE BALANCE SHEET and statement of surplus of the Arundel Corp., Baltimore, Md., sand and gravel producer and dredging contractor, is announced as follows:

BALANCE SHEET OF THE ARUNDEL CORP. AS OF DECEMBER 31, 1930

ASSETS

Current assets:		
Cash		$ 981,157.37
Marketable securities at cost, not above market value		1,829,674.53
Accounts receivable		824,409.40
Notes receivable		2,172.52
Mortgage receivable		45,000.00
Accrued interest and sundry debtors		22,473.42
Materials and supplies		30,904.65
		$ 3,735,791.89
Investment and deferred assets:		
Notes of Everglades Drainage District and accrued interest		$ 1,884,108.01
Other accounts receivable		102,637.33
Stocks and bonds		404,897.42
		$ 2,391,642.76
Fixed assets:		
Land, buildings, machinery, floating equipment, etc., at values as appraised by Lockwood Green Co., Inc., as of September 1, 1919, subsequent acquisitions at cost		$ 8,584,649.52
Less reserve for depreciation and depletion		3,695,185.08
		$ 4,889,464.44
Deferred charges to future operations:		
Prepaid insurance		54,092.48
		$11,070,991.57

LIABILITIES

Dividend payable January 2, 1931	$ 369,391.50
Accounts payable	286,837.90
Accrued expenses	11,817.75
Provision for federal tax on income payable in 1931	215,825.84
	$ 883,872.99
Deferred income on contracts	51,276.87
Reserve for insurance	135,560.18
Capital stock:	
Authorized, 500,000 shares of no par value:	
Whereof, 495,426 shares issued for	$ 4,954,260.00
Less: 2,870.4 shares reacquired and held in treasury	28,704.00
	$ 4,925,556.00
Surplus, per accompanying statement	$ 5,074,725.53
	$10,000,281.53
Contingent liabilities:	
Notes receivable discounted	$ 11,492.00
Subscription to barge syndicate	176,433.76
Federal tax on income of uncompleted contracts and additional tax on income of prior years	126,354.90
	$ 314,280.66
	$11,070,991.57

STATEMENT OF SURPLUS FOR THE YEAR 1930

Balance, January 1, 1930		$ 3,635,909.85
Add increase in net income for prior years resulting from the redetermination of charges for depletion and depreciation based on appraised values of fixed assets acquired at the inception of the corporation		$ 752,687.58
		$ 4,388,597.43
Income from operations for the year 1930, before provision for federal tax on income		$ 2,442,891.77
Less loss on abandonment and reconstruction of fixed assets		63,371.83
		$ 2,379,519.94
		$ 6,768,117.37
Deduct:		
Dividends		$ 1,477,566.00
Provision for federal tax on income		215,825.84
		$ 1,693,391.84
Balance, December 31, 1930		$ 5,074,725.53

Bond Holders Form Protective Committee—Rockland and Rockport Lime Corp.

A PROTECTIVE COMMITTEE for holders of first mortgage 6% bonds of the Rockland and Rockport Lime Corp., Rockland, Me., has been formed consisting of H. McDougall, Walter S. Wyman, Blinn W. Page, Charles Ault and Clifford M. Brewer. The committee urges bondholders to become parties to protective agreement by depositing their bonds with Fidelity Trust Co., Portland, Me.

The first mortgage 6% bond issue on which February 1 interest was not paid, amounts to $451,500. In addition the corporation guarantees $300,000 Hoosac Valley Lime Co., Inc., first mortgage 6s and $128,000 Rockland Transportation Co. 15-year preferred marine mortgage 6½s.

North American Cement Corp.'s Report

THE report of North American Cement Corp., Albany, N. Y., for the year ended December 31, 1930, shows net profit of $263,092, after interest, depreciation, depletion and federal taxes, equivalent to $5.09 a share (par $100) on 51,500 shares of 7% preferred stock, on which there is an accumulation of unpaid dividends. This compares with $282,294 or $5.48 a share on preferred in 1929.

Income account for year 1930 compares as follows:

Annual Statement of the Giant Portland Cement Co.

A COMPARATIVE statement of income account of the years ending December 31, 1930, and 1929, of the Giant Portland Cement Co., Egypt, Penn., is as follows:

Net after depreciation and taxation	1930 $ 115,132	1929 $ 87,839
Other income	18,517	17,205
Total income	133,649	105,044
Fixed charges	407	2,160
Reserve for taxes	13,856	10,016
†Other charges	7,868	8,607
Balance	111,518	84,261
Preferred dividends	127,979	131,015
Surplus	*16,461	*46,754
Earned per share, preferred ($50 par)	2.96	2.26
Number of preferred shares	37,600	37,233

*Deficit. †Loss on dismantling machinery, etc.

BALANCE SHEET, AS OF DECEMBER 31, 1930

Assets:	1930	1929
Property (less depreceiation)	$2,660,368	$2,771,724
Securities owned	56,362	2,009
Current Assets:		
Inventories	378,215	399,273
Bills and accounts receivable (net)	41,034	60,661
Cash	329,050	230,809
Notes receivable, etc.	59,925	99,875
Sundry debtors, etc.	3,302	3,172
Interest received, etc.	5,558	3,474
Demand loan	100,000	100,000
Deferred charges	8,475	6,083
Total	$3,642,189	$3,677,080
Liabilities:	1930	1929
Preferred stock	$1,880,000	$1,861,650
Common stock	1,110,000	1,104,050
Bonded debt		29,000
Current Liabilities:		
Accounts payable, etc.	24,244	28,434
Payroll, etc.	1,840	6,403
Accrued interest and taxes	14,821	11,190
Reserve for contingencies, etc.	15,000	23,607
Surplus	596,284	612,746
Total	$3,642,189	$3,677,080
Current assets	$ 916,984	$ 897,264
Current liabilities	40,905	46,027
Working capital	$ 876,079	$ 851,237

COMPARATIVE INCOME ACCOUNTS OF THE NORTH AMERICAN CEMENT CORP.

	1930	1929	1928	1927
Net sales	$4,584,574	$4,863,582	$5,538,741	$5,916,073
Costs and expenses	3,149,674	3,430,508	4,159,242	4,519,889
Balance	$1,434,900	$1,433,074	$1,379,499	$1,396,184
Other income	23,575	26,745	36,024	37,659
Total income	$1,458,475	$1,459,819	$1,415,523	$1,433,843
Depreciation and depletion	723,253	662,513	672,175	605,480
Interest and amortization, etc.	449,772	491,643	562,248	563,669
Federal taxes	22,358	23,369	(*)	36,809
Net profit	$ 263,092	$ 282,294	$ 181,100	$ 227,885
Preferred dividends	88,443	90,125	90,125	270,375
Surplus	$ 174,649	$ 192,169	$ 90,975	$ †42,490

*Company wrote off from surplus, during 1928, $295,295 for the replacement of obsolete machinery, making unnecessary any reserve for federal taxes. †Deficit.

COMPARATIVE BALANCE SHEETS OF THE NORTH AMERICAN CEMENT CORP.

ASSETS

	1930	1929	1928	1927
*Real estate, buildings, equities, etc.	$12,926,779	$13,453,098	$13,946,741	$13,707,236
Cash	735,354	778,979	359,888	488,227
Accounts and notes receivable	364,468	258,047	442,611	297,080
Inventories	792,586	1,015,089	966,297	1,095,921
Investments	7,250	62,798	27,015	13,937
Treasury securities	298,700	.....	.....	.....
Employes' stock subscriptions	.....	.....	.....	30,749
Sinking fund	584	584	584	584
Prepaid expenses	608,031	661,168	715,812	779,487
Total	$15,733,752	$16,229,763	$16,458,948	$16,413,221

LIABILITIES

Preferred stock	$ 5,150,000	$ 5,150,000	$ 5,150,000	$ 5,150,000
Common stock	1,412,500	1,412,500	1,412,500	1,412,500
Bonds	6,880,500	7,135,500	7,366,500	7,557,500
Accounts payable	56,428	302,824	358,955	165,873
Accrued wages, interest, etc.	181,269	200,466	206,616	220,932
Plant additions	.....	54,000	294,663	.....
Federal tax reserve	38,935	32,369	.....	36,810
Reserves	62,636	66,183	59,941	54,935
Interest and earned surplus	1,951,484	1,875,921	1,609,773	1,814,671
Total	$15,733,752	$16,229,763	$16,458,948	$16,413,221

*After depreciation and depletion. †Represented by 133,250 no-par shares.

Republic Portland Cement Co. Statement

THE EARNINGS of the Republic Portland Cement Co., San Antonio, Tex., are reported as follows, for the period September 1, 1929, to December 31, 1930:

Sales	$2,712,722
Cost of sales	1,001,900
Operating expenses, depreciation, etc.	902,020
Selling and general expense	405,182
Operating income	403,620
Other income	132,859
Total income	536,479
Bond interest	97,877
Federal taxes	41,155
Net income	397,447
Preferred dividends	112,629
Surplus	$ 284,818
Earned per share, common	1.14

Based on 249,620 common shares.

Balance Sheet, as of December 31, 1930

Assets:	1930	1929
*Property and equipment	$3,406,460	$3,516,277
Current assets:		
Cash	52,126	73,376
Accounts receivable	178,256	97,611
Inventories	222,811	215,906
Other assets	71,205	.....
Deferred charges	3,908	19,031
Total	$3,934,767	$3,922,201
Liabilities:		
Preferred stock	$1,130,000	$1,250,000
†Common stock	1,248,100	1,240,000
Bonded debt	1,181,000	1,250,000
Current liabilities:		
Accounts payable	39,595	53,588
Accruals	51,255	.....
Depletion reserve	.....	2,363
Insurance and tax reserve	.....	4,691
Surplus	284,818	121,559
Total	$3,934,767	$3,922,201
Current assets	$ 453,194	$ 386,893
Current liabilities	90,849	53,588
Working capital	$ 363,345	$ 333,305

*After depreciation and depletion accrued to December 31, 1930, $144,694.

†Represented by no par shares: 1930, 249,620; 1929, 248,152.

Annual Statement of the Trinity Portland Cement Co.

IN HIS ANNUAL REPORT to stockholders of the Trinity Portland Cement Co., Dallas, Tex., W. H. L. McCourtie, president, is quoted as stating:

"In line with predictions made in our last annual report—notwithstanding the general depression then existing became more acute during and throughout the year than was anticipated—the Trinity company sold nearly as much cement in 1930 as it did in 1929, and with practically the same net profit. Once more the efficiency and strategic location of our plants have been definitely demonstrated.

"It is proper to state in this connection that government reports show the consumption of cement in the United States as a whole to be considerably less for 1930, and also that the F. W. Dodge reports show new construction in 1930 in the 37 states east of the Rocky Mountains as being 22% less than for 1929. Our own showing by comparison should therefore be considered satisfactory.

"The duty of 2½ cents per bbl. on cement imported into the United States—as passed by the Congress in 1930—has afforded some measure of protection to the industry, but has not yet sufficed to permit our getting a full proper price for a substantial quantity of our product shipped to port cities in south Texas.

"We are glad to report another year of operation at all plants without fatal injury. Our Fort Worth plant was operated without a single lost-time accident during 1930. All of our plants have now won the Portland Cement Association safety trophy awarded for going without a lost-time accident for a calendar year.

"We hesitate to make predictions for 1931. It is true there will undoubtedly be a larger road building program than in any previous year, from which we should receive our share of cement sales. On the other hand, public work—including roads—has never in any one year accounted for more than 35% of the total cement sales.

"The two principal industries of Texas—agriculture (cotton) and petroleum—are in a very unhealthy condition. It is from the net proceeds of these industries that the bulk of our business originates. The volume of our product which 1931 will require is, therefore, not only uncertain, but the price structure of portland cement throughout this section is now in a very chaotic condition. Our purpose is to manage the best we can under the circumstances.

"No substantial expenditures of capital are contemplated, except such as are necessary to protect our properties and maintain our plants at the best efficiency."

CONDENSED FINANCIAL STATEMENT OF THE TRINITY PORTLAND CEMENT CO.

(As of December 31, 1930)

ASSETS

Current assets and investments		$ 611,569.93
Inventories		908,769.55
Prepaid expenses		25,615.30
Plant property and equipment	$9,099,995.97	
Less depreciation and depletion	2,055,164.87	7,044,831.10
		$8,590,785.88

LIABILITIES

Capital stock	$3,500,000.00
Deferred liabilities—Bonds outstanding	900,000.00
Surplus	3,941,699.79
Current accounts and taxes	223,778.52
Reserves for current expenses	25,307.57
	$8,590,785.88

Annual Report of the Calaveras Cement Co.

ARTHUR B. SHELBY, vice-president and general manager of the Calaveras Cement Co., San Francisco, Calif., reports for the year 1930 to the stockholders of the company that "consumption of cement during 1930 throughout the territory served was considerably lower than for several years. Building construction declined steadily during the entire year and few major projects were undertaken. While the demand for cement continues light, building permits are showing some increase and many large projects should soon be under way. This activity should be reflected in shipments during the remainder of this year.

"It is gratifying to note the maintenance of the splendid liquid position of the company, the ratio of quick assets to current liabilities having risen from 6.77 to 1 in 1929 to 11.92 to 1 in 1930, while cash items of $692,834.38 alone exceed surplus. The net profits shown were earned after deducting all expenses, including ample provision for depreciation of over $100,000. All surplus funds are carried on an interest paying basis. Marked improvements have also been made in operating conditions."

BALANCE SHEET OF THE CALAVERAS PORTLAND CEMENT CO. AS OF DECEMBER 31, 1930

ASSETS

Current assets:		
Cash in banks and on hand	$542,834.38	
Certificates of deposit due January 29, 1931	150,000.00	
Accounts receivable, less reserves	103,252.72	
Notes receivable	29,775.73	
Inventories of finished product, raw materials and supplies	437,140.85	
		$1,263,003.68
Investments at cost:		
Including 600 shares Calaveras Cement Co. 7% preferred stock		58,050.00
Balance due on deferred property sales contract		159,500.00
Capital assets:		
Land, buildings, machinery and equipment	$2,083,060.21	
Less reserves for depreciation and depletion	483,293.97	1,599,766.24
Deferred charges		12,037.05
		$3,092,356.97

LIABILITIES

Current liabilities:		
Accounts payable, including provision for federal income tax	$66,375.97	
Dividend payable January 15, 1931	39,576.25	$105,952.22
Capital stock:		
Preferred 7%: Authorized, 30,000 shares of $100 par value; issued 22,615 shares	$2,261,500.00	
Common: Authorized, 180,000 shares of no par value; issued, 125,230 shares	52,730.00	2,314,230.00
Surplus:		
Balance January 1, 1930	$739,028.42	
Net profit for year ended December 31, 1930	91,291.78	
	$830,320.20	
Less dividends on preferred stock	158,145.45	672,174.75
		$3,092,356.97

STATEMENT OF PROFIT AND LOSS OF THE CALAVERAS CEMENT CO.

(For Year Ended December 31, 1930)

Gross profit from operations after deducting depreciation and depletion	$295,525.94
Add: Interest (net) and miscellaneous income	29,614.53
	$325,140.47
Less: Selling, administrative and all other expenses, including provision for federal income tax	233,848.69
Net profit for year ended December 31, 1930	$91,291.78

For a comparison with the previous year, 1929, the following is given:

STATEMENT OF PROFIT AND LOSS OF THE CALAVERAS CEMENT CO.

(For Year Ended December 31, 1929)

Gross profit from operations	$820,480.81
Profit from sales of capital assets	17,948.35
	$838,429.16
Less selling, administrative and all other expenses, including provision for federal income tax	313,575.70
Net profit for year ended December 31, 1929	$524,853.46

Importance of Portland Cement Manufacture in Spain

THE SPANISH PAPER *Cemento*, Vol. No. 18, publishes part of a paper by Patricio Palomar, director of the "Ashland" companies, which have cement mills in several parts of Spain. Its title is "Importance of the Manufacture of Portland Cement in Spain and Its Relation to Other Industries." A condensed translation, or abstract, follows:

In all countries the raw materials used for making cement are produced nationally and this is true in Spain where 2,500,000 tons of rock are used annually, shortly to be raised to 3,500,000 tons. The clay used is also of the country. Spain mostly uses coal from its own mines, although it occasionally imports coal from England for making cement. About 500,000 tons of coal are used annually, divided between the coal for burning clinker and coal for power plants. This tonnage represents 15% of the total Spanish coal production. One must take into account, too, that some companies buy electric power and others produce it from their own hydro-electric plants. About 180,000,000 kw.h. are used annually. Waste-heat installations have been made by three of the Ashland plants, Villaluenga, Pobla and Belbao.

Jute sacks account for 6,000,000 pesetas sent abroad annually. The universal adoption of a new type of sack which is made in Spain would save from 900,000 to 1,000,000 pesetas a year.

The cement making machinery is imported but a great part of the repairs and replacements are made in Spain. It is calculated that this saves about 2,000,000 pesetas annually. Gears of large diameter, liners, grinding balls and other parts of mills, chains, shafting and a great quantity of cast-iron parts, belts and so on are made in the country and give satisfactory service. Lubricants are of foreign oils, mostly refined in Spain. Refractories of very superior quality and long life are a product of the country and explosives are nationally made.

The principal items of this sort cost annually:

	Pesetas
Refractories	500,000
Liners and other mill parts	600,000
Balls for mills	350,000
Small balls for fine grinding	500,000
Antifriction metal	150,000
Explosives	550,000
Sacks	6,000,000
Thead	300,000
Miscellaneous	2,500,000
Total	11,450,000

It will be seen that any increase in cement manufacture will be reflected automatically in other industries.

In the early period of the industry foreign engineers, especially those from the United States and Germany, built and operated plants. But now there is an important nucleus of industrial engineers familiar with cement making. The greater number of Spanish cement plants are now directed by Spanish engineers, and there are other very distinguished engineers, especially those who build bridges, roads and other public works, who dedicate themselves to the experimental study of portland cement concrete. There are many important laboratories, outside of those at the factories, for testing and studying cement, including those of the School of Roads at Madrid, the Laboratory of Material of the Army Engineers and the Provincial Testing Laboratory of Barcelona. Certificates from these have an official character. The central laboratory of the Ashland companies tests all the Spanish cements and the most important of the foreign cements in addition to its research work.

Generally speaking, the Spanish cement industry requires a day-and-a-half's work of one man for each ton of daily production. That means that about 7500 workmen are employed. If the salesmen, warehousemen and others employed outside are added the total will be about 10,000 men and this represents an annual payroll of about 10,000,000 pesetas. (At the time this was written exchange was probably about 7 pesetas for $1. —Editor.)

Federal Trade Commission After California Cement Data

A REQUEST has been made by the Federal Trade commission for proceedings of the legislative committee which in 1929 investigated the price of cement of California. Senator Norris of Nebraska has presented in congress a resolution asking investigation of cement prices throughout the country, aimed to determine whether or not prices are fixed by agreement.

The California senate, at its 1929 session, adopted a resolution calling for an investigation of the so-called "cement trust" in California. This committee gathered considerable testimony, but the state supreme court ruled that the senate was without authority to compel appearance of company officials with books and documents.

Recent Dividends Announced

Associated Portland Cement Mfrs. Amer.	8%,	Apr. 6
Boston Sand and Gravel com. (qu.)	0.30,	Apr. 1
Boston Sand and Gravel pfd. (qu.)	0.87½,	Apr. 1
Consol. Oka Sand and Gravel Ltd. pfd. (qu.)	1.75,	Apr. 1
Const. Materials pfd. (qu.)	0.87½,	May 1
Consumers Co. pr. pfd. (qu.)	1.50,	Apr. 1
Newaygo Portland Cement pfd. (qu.)	1.75,	Apr. 1
Pacific Portland Cement pfd. (qu.)	1.62½,	Apr. 4
Santa Cruz Portland Cement (qu.)	1.00,	Apr. 1
Superior Portland Cement Cl. A (mo.)	0.27½,	May 1

Consulting Service on Steel Castings

THE STEEL FOUNDERS' Society of America, Inc., advises that with the establishment of an engineering department under the direction of an experienced metallurgist and engineer, it is now able to offer a consulting service to mechanical engineers, designers and others engaged in the selection and application of metals and responsible for their proper use in metal products of all kinds.

Indicative of the type of service rendered, for which there is no charge or obligation, is assistance with such problems as the following: (1) Proper apportioning of metal sections for best casting results; (2) advice as to the types of cast steels which are available to satisfy desired physical specifications; (3) re-design of products previously constructed in metals other than cast steel; (4) re-design of cast steel members with which trouble has been experienced either in production or service; (5) assistance in locating a foundry capable of handling individual requirements; (6) authoritative information on the relative merits of cast steel as compared with other materials in meeting specific service conditions; (7) consulting on engineering problems involved in the construction of machinery and equipment of all kinds where cast steel is being considered; (8) informal discussions with small groups of designers and others interested, to help them obtain a better working knowledge of the products of the steel foundry.

Problems in metal construction on which help is desired, should be addressed to the Development Engineering Department, Steel Founders' Society of America, Inc., 420 Lexington avenue, New York, N. Y.

Cement Salesman Out for Governor of Kentucky

ANDREW O. RITCHIE, Lexington, Ky., state representative of the Southwestern Portland Cement Co., recently announced his candidacy for the Republican nomination for governor.

Mr. Ritchie is the second Republican candidate to announce for governor. The other Republican seeking the governor nomination is Silas A. Sullivan, Jamestown, Russell county farmer and lawyer.

In his formal announcement made public here recently, Mr. Ritchie urged the creation of a "non-political" banking commission, farm relief commission and a three-membered state highway commission, and the vesting of executive authority in the state highway engineer.

Four years ago Mr. Ritchie sought the Republican nomination for Lieutenant governor, but was defeated. He was born in Paris, Bourbon county, and educated in the Ludlow public schools, Ludlow, and the Armour Institute of Technology, Chicago, Ill.—*Frankfort* (Ky.) *State Journal.*

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Mar. 7	Limestone Flux Week ended Mar. 14	Sand, Stone and Gravel Week ended Mar. 7	Sand, Stone and Gravel Week ended Mar. 14
Eastern	1,269	1,404	1,306	1,053
Allegheny	1,634	1,570	1,698	1,482
Pocahontas	111	93	617	640
Southern	560	667	5,240	6,413
Northwestern	349	560	776	811
Central Western	362	457	3,577	3,567
Southwestern	124	74	3,430	4,117
Total	4,409	4,825	16,644	18,083

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

District	Limestone Flux 1930 Period to date Mar. 15	Limestone Flux 1931 Period to date Mar. 14	Sand, Stone and Gravel 1930 Period to date Mar. 15	Sand, Stone and Gravel 1931 Period to date Mar. 14
Eastern	21,926	13,247	22,030	11,564
Allegheny	23,932	15,884	26,093	14,662
Pocahontas	1,761	954	5,543	4,917
Southern	6,196	5,544	63,694	59,611
Northwestern	5,204	2,719	10,087	9,120
Central Western	4,882	4,297	54,415	33,542
Southwestern	3,280	2,486	43,486	33,967
Total	67,181	45,131	225,348	167,383

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	1931
Limestone flux	*67,181*	*45,131*
Sand, stone, gravel	*225,348*	*167,383*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of April 4:

SOUTHERN FREIGHT ASSOCIATION DOCKET

54509. **Clay, gravel (unwashed)**, between Moore Central Ry. Co. stations on single line traffic and between Moore Central Ry. stations on the one hand and stations on other lines within the state of North Carolina, intrastate on the other. It is proposed to establish the main line or trunk line basis of rates on clay, gravel (unwashed), carloads, between Moore Central Ry. stations as provided in Note 51, column "A," description A-510, Agent Cottrell's I. C. C. No. 767.

54528. **Stone, crushed** and powdered whitestone, Whitestone, Ga., to Cumberland, Md. Present rate—Combination. Proposed rate on stone, crushed and powdered whitestone, carloads, minimum weight 60,000 lb., from Whitestone, Ga., to Cumberland, Md., 462c per net ton, same as currently in effect to Baltimore, Md.

54562. **Sand, gravel, crushed stone, etc.**, carloads, points in Mississippi and Louisiana east of the Mississippi river to points in S. W. F. B. territory. It is proposed to establish rates on sand, gravel, crushed stone, etc., as prescribed in I.C.C. Docket 17000, part 11, from and to the above named points based on scale prescribed in I. C. C. Docket 17000, part 11, plus 8c per ton to cover transfer at lower Mississippi river crossings.

SOUTHWESTERN FREIGHT BUREAU DOCKET

22554. **Limestone**, from Valmeyer, Ill., to points in Oklahoma and Texas. To establish on limestone, ground or crushed, carloads (See Note 3), from Valmeyer, Ill., to points in Oklahoma and Texas shown below, specific rates based on 8½% of the contemporaneous first-class rates published in S. W. L. Tariff 151. In the event that instances arise where, on account of the fourth section, the 8½% basis cannot be applied via all desired routes to certain points, it will be proper to employ a higher basis, the 8½% basis to be observed as minimum. Also the rates are to be made sufficiently high to clear Arkansas and Louisiana border points where rates are today on the I. C. C. Docket 9702 basis in S. W. L. Tariff 114D. Also, no reductions are contemplated to Missouri and Kansas points from St. Louis group.

POINTS IN OKLAHOMA

Vinita	Shamrock	Ada
Fairland	Weleetka	Bromide
Grove	Austin	Wapanucka
Bartlesville	Okmulgee	Durant
Nowata	Henryetta	Atoka
Chelsea	Crowder	Hugo
Adair	McAlester	Valliant
Spavinaw	Hartshorne	Buffalo
Westville	Wilburton	Tupelo
Tulsa	Albion	Woodward
Claremore	Fogee	Clinton
Muskogee	Manchester	Mountain View
Wagoner	Enid	Lawton
Sallisaw	Perry Guthrie	Duncan
Spiro	Oklahoma City	Lindsay

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Ft. Gibson	Fallis	Ardmore
Foraker	Shawnee	Marietta
Osage	Sparks	Madill
Nelagony	Francis	Texas Jct.
Sand Springs	Holdenville	Sulphur
Sapulpa	Allen Reynolds	Goodwin
Boynton	Antlers	Hammon Jct.
Glenpool	Waynoka	Elk City
Checotah	Fairview	Mangum
Bokoshe	Okeene	Altus
Wister	Cherokee	Frederick
Howe	Alva	Grandfield
Rock Island	Avard	Waurika
Blackwell	Bridgeport	Terral
Ponca City	El Reno	Ringling
Pawnee	Anadarko	Healdton
Hallett	Chickasha	Cheyenne
Cushing	Purcell	Texola
Jennings	Wayne	Hollis
Stroud	Byars	El Dorado

POINTS IN TEXAS

Marshall	Orange	Yoakum
Paris	Silsbee	Bay City
Sulphur Springs	Paducah	San Marcus
Waynesboro	Sagerton	San Antonio
Longview	Hamlin	Brady
Denison	Abilene	San Angelo
Sherman	Seymour	Big Spring
Gainesville	Ranger	Sweetwater
Greenville	Brownwood	Tuscola
Mineola	Dublin	Lubbock
Tyler	Waco	Devine
Jacksonville	Hillsboro	Corpus Christi
Nacogdoches	Spearman	Gregory
Loganport	Shamrock	Three Rivers
Quanah	Miami	Pleasanton
Chillicothe	Temple	Kenedy
Vernon	Granger	Crystal City
Wichita Falls	Taylor	Gardendale
Bridgeport	Cameron	Spofford
Ft. Worth	Giddings	Omego
Carrollton	Elgin	Monahans
Dallas	Somerville	Kingville
Waxahachie	Milans	Alice
Corsicana	Amarillo	Falfurrias
Athens	Bryan	Laredo
Oakwood	Navasota	Raymondville
Palestine	Sealy	Brownsville
Crockett	Houston	Eagle Pass
Lufkin	Galveston	
Beaumont	Bloomington	

Shippers at Valmeyer state they cannot compete with shippers in the Southwest where the 17000 part 11 basis of rates is in effect, mainly shippers in Arkansas, and request the same basis of rates. However, it was felt that the 8½% basis, as contended for by carriers in pending proceedings, was as low as the carriers would go in this instance. The shipper has agreed to give this basis a trial. In view of this it is felt the proposed basis should be checked out and the rates made available for shipments in the immediate future.

22591. **Sand**, from Klondike, Mo., to Houston, Tex. To establish a rate of 23c per 100 lb. on sand (except asbestos sand), carloads, description and minimum weight as per Item 778, S. W. L. Tariff 2N, from Klondike, Mo., to Houston, Tex. Prior to publication of rates under I. C. C. Docket 17000, part 11, of October 17, 1929, Shreveport combination of 23c, the same as applicable from Gray Summit and Pacific was available from Klondike. However, effective upon the above date, in conjunction with I. C. C. Docket 17000, part 11 (which applied on sand other than silica), Agent Fonda canceled all former rates on sand, the Texas Commission having authorized cancellation of rates between points in Texas on silica sand, account of no movement. This situation now results in Klondike having a rate of 33½c as compared with rate of 31c from Illinois producing points and 23c from Grays Summit and Pacific, Mo., published in S. W. L. Tariff 2-series.

22620. **Silica sand**, from Guion, Ark., to Oklahoma City, Okla. To establish a rate of 15½c per 100 lb. on silica sand, carloads (See Note 2), from Guion, Ark., to Oklahoma City, Okla. The purpose of the above is to provide routing in connection with the F. S. & W. Ry. The proposed rate is now published in Item 3175A, Supplement 127 of S. W. L. Tariff 15N, but is not applicable in connection with the F. S. & W. and all that is desired is to meet the rate at Oklahoma City that is now in effect via other lines.

22624. **Glass sand**, from Gray's Summit and Pacific, Mo., to Oklahoma City, Okla. To establish a rate of 16c per 100 lb. on glass sand, carloads (See Note 2), from Gray's Summit and Pacific, Mo., to Oklahoma City, Okla. Item No. 7182E, S. W. L. Tariff 15N, provides for a 16c rate from Gray's Summit and Pacific, Mo., to Oklahoma City but this rate is not applicable in connection with the F. S. & W. and this proposal is only for the purpose of establishing a route in connection with the F. S. & W. to Oklahoma City so that rates will apply via the F. S. & W. to the same extent as now applicable via other lines reaching Oklahoma City.

22629. **Sand, gravel, etc.**, from points in Mississippi and Louisiana to points in Louisiana. To establish rates on sand, gravel, crushed stone, etc., as prescribed in I. C. C. Docket 17000, part 11, from points in Mississippi and Louisiana east of the Mississippi river to points in Louisiana east of the Mississippi river to points in Louisiana west of the Mississippi river, based on scale prescribed in I. C. C. Docket 17000 part 11, plus 8c per ton to cover transfer at lower Mississippi river crossings. Upon request concurred in by directly interested lines, same basis to be established to points in Arkansas, Oklahoma and Texas. In I. C. C. Docket 17000 part 11, the commission prescribed a mileage scale of rates on sand, gravel and crushed stone and similar commodities between points in Southwestern territory and under 13th section order these rates were made applicable between points in Louisiana on intrastate traffic. For some time the shippers east of the Mississippi river have complained of their inability to sell their products at points in western Louisiana and it is felt that they should be permitted to do so on a scale not higher than that applies intra-territorially within the Southwest.

CENTRAL FREIGHT ASSOCIATION DOCKET

27939. To cancel rates published on pages 11 to 44, inclusive, of C. C. C. & St. L. Ry. Tariff 1733-I, as amended, on stone and articles taking **stone** rates, described in Items 1 and 2, page 7 thereof, from Laurel, Ind., and Ludlow Falls, O., to various destinations located in Illinois, Indiana, Michigan, Ohio, New York, Pennsylvania and West Virginia, allowing classification basis to apply in lieu thereof.

27940. To establish on **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars; **stone, crushed**, in bulk, in open-top cars, and **stone screenings**, in bulk, in open-top cars, in

straight or mixed carloads (See Note 3), from Narlo, O. Class rates apply at present.

To Pennsylvania points	Prop.	To Penn. points Erie R. R.	Prop.
B. & L. E. R.R.		Corry	180
Albion	160	Concord	180
Springboro	160	Cambridge Springs	170
Linesville	170	Meadville	160
Mercer	180	Franklin	170
Grove City	180	Sugar Creek	170
Harrisville	180	Greenville	150
		Pulaski	160

27951. To establish on **stone**, breakwater and rip rap, in carloads (See Note 1), except when car is loaded to full cubical or visible capacity actual weight will apply, from Amherst, O., to Oswego, N. Y. Proposed rate, $2.50 per 2000 lb.; present, 27½c per hundredweight.

27952. To cancel commodity rates on **agricultural limestone**, carloads, as shown in N. Y. C. Tariff I. C. C. O. C. 233, from Arlington, O., to points in Central Freight Association territory, account present rates being obsolete. Classincation basis to apply in lieu thereof.

27962. To amend Wabash Ry. Tariff I-16144, naming rates on **sand**, carloads (See Note 3), from Gary-Calumet-Willow Creek, Ind., group.

To	Delivering Lines	Rate
Chicago, Ill.	*	63
East Chicago, Ind.	*	50
Grasselli, Ind.	*	50
Hammond, Ind.	*	50
Hegewisch, Ind.	*	50
Whiting, Ind.	*	50
Other deliveries in Chicago district as specified in Agent Galligan's Tariff 20-series	†	84
Point of interchange (See Note 1) with	‡	63

*Wabash Ry.
†All other lines than Wabash.
‡Chicago & Calumet R. R.

Note 1—The Wabash Ry. will assume any necessary switching or trackage charge to reach the lines named. The charges for these lines will be in addition to the rate herein named to point of interchange.

By including Crocker, Ind., as a point of origin therein.

(b) To amend Wabash Ry. Tariff 16505, naming rates on **sand, gravel, crushed stone**, etc., to points in Illinois (other than the Chicago district), Indiana, Ohio, Michigan, Pennsylvania, etc., by adding Crocker, Ind., as a point of origin in the Gary-Calumet-Willow Creek group. Present, classification basis.

27986. To establish on **sand and gravel**, carloads (See Note 3), from Lafayette, Ind., to Riverdale, Ind., rate of 120c per net ton. Present, sixth class rate of 17c. Route—Via C. I. & L. Ry., Mitchell, Ind., B. & O. R. R.

27987. To establish on **sand and gravel**, carloads (See Note 3), from Massillon and Navarre, O., to Augusta, Watheys and Mechanicstown, O., rate of 80c per net ton. Present rate, 90c per net ton.

28003. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) and **gravel**, carloads (See Note 3), from Winona Lake, Ind., to Hoagland, Ind., rate of 80c per net ton. Present rate, 75c per net ton.

28006. To establish on **crushed stone**, carloads (See Note 3), from Melvin, O., to the following points in Ohio:

To	Prop.	Pres.	To	Prop.	Pres.
Canaanville	90	100	Torch Hill	90	(*)
Guysville	90	100	Little Hocking	100	(*)
Stewart	90	100	Porterfield	100	(*)
Frosts	90	100	Belpre	100	(*)
Coolville	90	100			

*Sixth class. Route—Via B. & O. R. R. direct.

28009. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads (See Note 3), from Indianapolis, Ind., to Rosston, Ind., rate of 75c per net ton. Present rate, 80c per net ton.

CENTRAL FREIGHT ASSOCIATION DOCKET

27905. To establish on **crushed stone** (in bulk, in open top cars, carloads (See Note 3), from Ransome, O., to Toledo, O., rate of 60c per net ton. Present, 70c per net ton.

28024. To establish rate on **sand and gravel**, carloads (See Note 3), from Munger, Ill., to points in Central Freight Assn. territory (representative points shown in Exhibit A), rates as shown in Exhibit A attached. Present rates as shown in Exhibit A, attached, reflect the Plainfield, Ill., combination.

28025 (a). To establish on **sand**, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads (See Note 2), but not less than 72,000 lb., except when car is loaded to full cubical or visible capacity actual weight will apply, but not less than 72,000 lb., from Phalanx, O., to Holden, Penn., rate of 227c per ton of 2000 lb. Present rate, 340c per ton of 2000 lb.

(b) To establish on **sand or gravel** (N.O.I.B.N. in Official Classification), carloads (see Note 2), but not less than 72,000 lb., except when car is loaded to full cubical or visible capacity actual weight will apply, but not less than 72,000 lb., from Phalanx, O., to Billings, Coder, Elmo, Fox, Glenn, Kline, Limestone, Reidsburg, Shippenville, Sutton and Van, Penn., rate of 227c per ton of 2000 lb. Present rate, 366c per ton of 2000 lb.

27910. To establish on **limestone, agricultural**, unburned, in bulk, in open top cars; **stone, crushed**, in bulk, in open top cars; **stone screenings**, in bulk, in open top cars, in straight or mixed carloads (See Note 3).

From Gibsonburg, O.

To Ohio points	Pro.	Pres.		Pro.	Pres.
Wilmer	95	*	Pontiac	90	*
Prout	95	*	Lexington	100	*
Kimball	95	*	Havana	85	85
Monroeville	90	*			

From Woodville, O.

To Ohio points	Pro.	Pres.		Pro.	Pres.
Wilmer	95	*	Pontiac	90	*
Prout	95	*	Lexington	100	*
Kimball	95	*	Havana	----	85
Monroeville	90	*			

*Classification basis.

*28047 (*Cancels W. D. A. 28003). To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) and **gravel**, carloads (See Note 3), from Winona Lake, Ind., to Hoagland, Ind., rate of 75c per net ton. Present rate, 80c per net ton.

28049. To cancel present commodity rates on **crushed stone**, crushed stone screenings, tailings and **agricultural limestone** (unburned, in bulk), in open top cars, carloads, from Delaware, O., to various destinations in Indiana, Ohio and West Virginia, etc., published on pages 29 to 69, inclusive, of C. C. C. & St. L. Ry. Tariff No. 1770X, I. C. C. 8542, and C. & O. Ry. Tariff No. B2221 (H. V. Ry. series), I. C. C. No. 1904, classification basis to apply in lieu thereof.

28050. To establish on **agricultural lime**, carloads, minimum weight 30,000 lb., from Scioto, O., to Apple Creek, Orrville, Marshallville, Gambier, Howard, Danville and Fredericksburg, O., rate of 8c. Present rate, 10c.

28073. To establish on **sand** (except glass, core, engine, filter, fire or furnace, foundry, blast, grinding or polishing, loam, molding and silica) and **gravel**, carloads (See Note 3), from Anderson, Ind., to Honey Creek, Ind., rate of 60c per net ton. Present rate, 65c per net ton.

28074. To establish on **sand and gravel**, carloads (See Note 3), from Dayton, O. (rates in cents per net ton):

To	Prop.	Pres.
Columbus Grove, O.	80	*90
Vandalia, O.	50	60

*Dayton, O., to Deshler, O., rate.
Route—Via B. & O. R. R. direct.

28075. To establish on **agricultural limestone**, in box cars, carloads, minimum weight 50,000 lb., from Gibsonburg and Woodville, O., to Bens Run, W. Va., rate of $2.02 per net ton. Present rate, $4.40 per ton.

28076. To establish on **sand and gravel**, carloads (See Note 3), from Marion, O., to Ohio City, O., rate of 80c per net ton. Present rate, 14c.

28085. To establish on **stone, crushed**, coated with oil, tar or asphaltum (known as amesite, carbo-rock or emeccrete), carloads, minimum weight marked capacity of car, except when car is loaded to full cubical or visible capacity actual weight will apply, from Marble Cliff and West Columbus, O., to points in Michigan, Illinois and Indiana (representative points shown in Exhibit A), rates as shown in Exhibit A attached.

28099. To establish on (a) **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads (See Note 3).

28090. To restrict rate of 10c published in Supplement 20 to C. C. C. & St. L. Tariff 1913A, Ohio No. 2559, on **agricultural lime**, carloads, from Scioto, O., to Warsaw Jct., O., by providing for application thereof as follows: Via C. C. C. & St. L. Ry., Columbus, O., thence P. R. R. through Mt. Vernon and Brinkhaven. Present—Routing open thereby allowing movement through Warsaw Jct. to Tunnel Hill and Cooperdale, O., higher rated points.

From Terre Haute, Ind.

To Ind. pts.	Pres.	Prop.	To Ind. pts.	Pres.	Prop.
Jessups	69	65	Guion	76	----
Catlin	70	65	Waveland	76	----
Rockville	75	65	Browns Valley	76	----
Sand Creek	76	65	New Market	76	----
Judson	76	----			

From Kenneth, Ind., and Lake Ciecott, Ind.

To Ind. pts.	Pres.	Prop.	To Ind. pts.	Pres.	Prop.
Jessups	138*	----	Guion	110	100
Catlin	138*	----	Waveland	110	100
Rockville	113	105	Browns Valley	110	100
Sand Creek	113	100	New Market	‡105	†90
Judson	113	100			

*Under intermediate application.
‡Present rate from Kenneth is 90c.
†From Lake Ciecott only.

Tariff Authority—P. R. R. 117A, I. C. C. F1918; P. R. R. 125A, I. C. C. 135; P. R. R. 118B, I. C. C. F2103.

(b) **Agricultural limestone**, unburned, in bulk, in open-top cars; **crushed stone**, in bulk, in open-top cars, and **stone screenings**, in bulk, in open-top cars, in straight or mixed carloads (See Note 3).

From Kenneth, Ind.

To Ind. pts.	Pres.	Prop.	To Ind. pts.	Pres.	Prop.
Jessups	138	----	Judson	113	100
Catlin	138	----	Guion	110	100
Rockville	113	105	Waveland	110	100
Sand Creek	113	100	Browns Valley	110	100

28100. To establish on **agricultural limestone**, in bulk, in open-top cars; **crushed stone**, in bulk, in open-ton cars; stone, quarry scrap, in open-top cars; stone, rip rap, in open-ton cars; stone screenings, in bulk, in open-top cars, and stone tailings, in bulk, in open-ton cars, carloads (See Note 3), from Greencastle and Limedale, Ind. Rates in cents per net ton.

To Ind. pts.	Pres.	Prop.	To Ind. pts.	Pres.	Prop.
N. Terre Haute	85	80	Catlin	85	80
Heckland	85	80	Rockville	85	80
Rosedale	85	80	Sand Creek	85	80
Jessups	85	80			

28102. To establish on **sand and gravel**, carloads (See Note 3), to Petersburg, Ind. Rates in cents per net ton.

From	Prop.	Pres.
Vincennes, Ind.	80	98
Allison Branch, Ill.	85	98

28104. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads (See Note 3), from Columbus, Ind., to Scipio and Queensville, Ind., rate of 65c per net ton. Present rate, 70c per net ton. Route—P. R. R. direct.

28105. To establish on **sand and gravel**, carloads (See Note 3), from Evansville, Ind., to Oakland City, Ind., rate of 70c per net ton. Present rate, 73c per net ton.

28106. To establish on **agricultural lime**, carloads, minimum weight 30,000 lb., from Scioto, O.

To	Prop.	Pres.
Amesville	11	13½
Bishopville, O.	11	13½
Cumberland, O.	14½	18
Lathrop, O.	11	13½
Senecaville, O.	14½	18
Stockdale, O.	10	13½

28110. To establish on **stone, crushed**, carloads, minimum weight when loaded in open cars will be 90,000 lb., except when for carrier's convenience a car of less capacity is furnished, in which event the minimum weight will be the marked capacity of the car used, from Shimer, O.

To	Prop.	Pres.
Greenfield, O.	105	Class rate
Bainbridge, O.	100	Class rate
Summit, O.	100	Class rate
Jackson, O.	(1)(2) 90	100
Herbert, O.	105	Class rate
Lisman, O.	95	Class rate

(1) Via Portsmouth, O., B. & O. R. R.
(2) Via Glen Jean, O., D. T. & I. R. R.

*28115. (*Cancels W. D. A. 27319.) To establish on **ground limestone**, agricultural (processed limestone), carloads, minimum weight 50,000 lb., from Barberton, O., to points within the state of Ohio, or intrastate movement only (representative points shown in Exhibit A attached), rates on the same level as present rates on ground limestone in box cars, as shown in Exhibit A attached. Present rates—Agricultural lime, approximately 60% of the present sixth class rate, as shown in Item 1545, Exceptions to Official Classification, C. F. A. L. Freight Tariff 130T. I. C. C. 2248. (Representative rates shown in Exhibit A attached.)

TRUNK LINE ASSOCIATION DOCKET

26341. (A) **Building lime**, carloads, minimum weight 30,000 lb.; (B) **chemical, blast, glass, agricultural, land and fluxing lime**, carloads, minimum weight 30,000 lb., to Cambria & Indiana R. R. stations, Colver to Romar, Penn., inclusive, from Cavetown-Pinesburg group, (A) 17c and (B) 16c per 100 lb., to Nant-Y-Glo and Revloc, Penn., from Cavetown-Pineburg group and Thomasville-Bittinger group, (A) 17c and (B) 16c per 100 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

M-1707. **Crushed stone**, carloads (See Note 2), from Bound Brook, N. J., to Long Branch, West End and Elberon, N. J., 90c per net ton. Present rate, $1.04 per net ton. Reason—Proposed rate is fairly comparable with rates to Little Silver, Matawan, Eatontown and North Long Branch, N. J.

23418, Sup. 2 (cancels Sup. 1). (A) **Building lime**; (B) **agricultural lime and land lime**; (C) **chemical lime**, carloads, minimum weight 30,000 lb., from Grove, Frederick, Security, Md., Martinsburg, Charles Town, W. Va., Winchester, Vaucluse, Cedar Creek and Strasburg, Va., district to Light Street, Orangeville, Forks, Stillwater and

Benton, Penn. (A) 17c, (B) 15c and (C) 16c per 100 lb.

26251, Sup. 1. **Ground limestone**, carloads, minimum weight 50,000 lb., from Cavetown, Pinesburg, Security, Nessle, W. Va., Thomasville, Bricklyn, York, Hanover and Bittinger, to D. & H. stations Greenfield to North Creek, N. Y., inclusive, 24c per 100 lb.

26346. To cancel from L. I. R. R.-I. C. C. No. 791 on **sand**, N. O. I. B. N., carloads, the following commodity rates from Farmingdale, N. Y., to Jersey City, N. J., 9c; Norfolk, Va., 20½c; Rahway, N. J., 9c; Washington, D. C., 14c per 100 lb. Reason—Investigation develops that no traffic has moved for some time, nor is there prospect of future movement, therefore rates are obsolete.

26352. **Limestone, ground or pulverized**, carloads, minimum weight 50,000 lb., from Munns, N. Y., to stations on the N. Y. C. R. R. and W. S. R. R. in New York state, viz.: Troy, Schenectady, Amsterdam, Fort Plain, Little Falls, Salisbury Center, Herkimer, Canastota, Syracuse, New Haven, Parish, Clay, Altmar, Westdale, Humaston, Adams, Watertown, Lowville, Remsen, McKeever, Beaver River, Childwold, Tupper Lake, Pattersonville, Mohawk, Eritown, Lebanon, rates ranging from $1 to $1.80 per net ton. Reason—Proposed rates are fairly comparable with rates from Jamesville, N. Y.

26359. **Stone, crushed**, coated with oil, tar or asphaltum, carloads (See Note 2), from Casparis, Penn., to Donora, Penn., $1.19 per net ton; present rate, sixth class. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

26361. **Stone, crushed or broken**, carloads (See Note 2), from Oriskany Falls, N. Y., to Utica, N. Y., 60c per net ton in lots of ten cars only; present rate, 75c per net ton. Reason—Proposed rate is comparable with rates from Oriskany Falls to New Hartford, N. Y., and from Haven to Monticello, N. Y.

26362. **Gravel and sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica), in straight or mixed carloads (See Note 2), from Canawaugus, N. Y., to Dansville, N. Y., $1 per net ton, plus switching charge of $4.50 per car. Reason—To meet motor truck competition.

26364. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand) and **gravel**, carloads (See Note 2), from Utica, N. Y., to St. Johnsville, N. Y., 80c Herkimer, Kast Bridge, Frankfort, Ilion, Mohawk, N. Y., 60c, County Home, Middleville, Little Falls, South Little Falls, N. Y., 70c per net ton. Reason—To meet motor truck competition.

26365. **Sand** (blast, engine, foundry, glass, molding and silica), carloads (See Note 2), from Stuyvesant, Germantown, Rhinecliff, Staatsburg, New Hamburg, Rensselaer, Albany, Troy, Green Island, Cohoes, Crescent, Niskayuna and Schenectady, N. Y., to Paterson, N. J., $2.90 per net ton. Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

26384. (A) **Sand**, carloads, when loaded in open cars; (B) **sand**, when loaded in box cars or other closed equipment (See Note 2), from Pinewald, Quail Run and Toms River, N. J., to Bristol, Penn., (A) $1.40, (B) $1.50, and to Morrisville, Penn., (A) $1.35 and (B) $1.45 per net ton. Reason—Proposed rates are fairly comparable with rates on like commodities from and to points in the same general territory.

26386. To add to Reading Co. Tariffs I. C. C. 617, 909 and J8766, applying on stone (rough, building, fluxing, fluxing limestone and limestone), carloads (See Note 3), on all commodities except rough stone, which is marked capacity of car, except when car is loaded to cubical or visible capacity, actual weight will apply to points on the Reading Co., Exton, Penn., as a point of origin, taking the same rates and minimum carloads weights as applicable from Mill Lane, Penn.

26387. **Sand**, other than blast, foundry, engine, glass, molding or silica, carloads, **gravel and crushed stone**, carloads (See Note 2), from Otisville, N. Y., to Erie R. R. stations, Jersey City, Bloomfield, Dundee, Fair Lawn, Newark, Mahwah, N. J., Tuxedo, Greycourt, Newburgh, Campbell Hall, Pine Island, Circleville, Pine Bush, Middletown, N. Y., Mill Rift, Rowlands, Hawley, Hoadleys, Lake Ariel, Scranton, Plains Jct., Penn., Callicoon, Gulf Summit, N. Y., Great Bend, Penn., Edgewater, Ridgefield, N. J., Haverstraw, N. Y., and various, rates ranging from 60c to $1.30 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

26393. **Stone**, natural (other than bituminous asphalt rock), crushed, carloads; stone, natural (other than bituminous asphalt rock), crushed, coated with oil, tar or asphaltum, carloads (See Note 2), from Stafford and Le Roy, N. Y., to Allegany, Vandalia and Riverside Jct., N. Y., $1.20 per net ton, to expire six months after the effective date. Present rate, 13½c per 100 lb. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

26394. To establish rates on:
(A) **Sand**, viz., blast, common, engine, molding, quartz, silica and silex, carloads.
(B) **Sand**, viz., blast, engine, quartz, silex and silica, carloads.
(C) **Sand**, viz., common and molding, carloads.
(D) **Sand**, viz., blast, engine, quartz, silex or silica, carloads.
(See Note 2.) From Tatesville, Penn., to (A) specific points in C. F. A. territory as shown in Items 6380 to 6410, inclusive, of Agent Curlett's I. C. C. A306; (B) and (C) points in Agent Curlett's I. C. C. A306, taking Rate Bases 60A and 60G, 76D and 78D to 120, inclusive; (D) Detroit, Mich., and Toledo, O., as shown in Item 6165 of Agent Curlett's I. C. C. A306. Rate same as in effect from Mapleton, Penn., as provided for in the above referred to items and Specific Group Nos. 276 and 395 of Agent Curlett's I. C. C. A306. Reason—Proposed rates are comparable with rates from Mapleton, Penn.

26396. **Crushed stone**, carloads (See Note 2), from Morrisville, Penn., to Mays Landing, N. J., $1.05, and to McKee City, N. J., $1.15 per net ton. Rates to expire November 30, 1931. Reason—To meet motor truck competition.

26399. To cancel from L. I. I. C. C. No. 862 on **beach sand**, carloads, the following rates, from Hammel (Rockaway Beach) and Rockaway Park, N. Y. (L. I. R. R.). Rates in cents per 100 lb.

To	Rates
Bayonne, N. J. (L. V.)	11
Dover, N. J. (C. R. R. of N. J. or D. L. & W. R. R.)	11½
Elizabeth, N. J. (C. R. R. of N. J.)	11½
Elmira, N. Y. (D. L. & W. R. R.)	17½
Fordham, N. Y. (N. Y. C. R. R.)	16
Harrison, N. J. (P. R. R. or D. L. & W. R. R.)	11½
Hastings-on-Hudson, N. Y. (N. Y. C. R.R.)	14
McKeesport, Penn. (P. R. R.)	18½
Newark, N. J. (P. R. R.)	11½
Passaic, N. J. (D. L. & W.)	11½
Paterson, N. J. (E. R. R.)	14
Phillipsburg, N. J. (C. R. R. of N. J.)	13
Pittsburgh, Penn. (P. R. R.)	18½
Rockaway, N. J. (C. R. R. of N. J. or D. L. & W. R. R.)	11½
Tuckahoe, N. Y. (N. Y. C. R. R.)	16
White Plains, N. Y. (N. Y. C. R. R.)	17
Wilson, Penn. (P. R. R.)	18½
Yonkers, N. Y. (N. Y. C. R. R.)	13

Reason—Investigation develops that no traffic has moved for some time, nor is there prospect of future movement, therefore rates are obsolete.

26400. **Sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel**, carloads (See Note 2), from Wyoming, Penn., to Wilkes-Barre, Penn., 60c per net ton. Rate applies for local delivery and does not include switching charges of connecting lines at Wilkes-Barre, Penn. Reason—Proposed rate is comparable with rates from Wyoanna, Penn., to Jenkins Jct., Avoca and Tunkhannock, Penn.

26401. **Sand**, common or building (not blast, engine, fire, foundry, glass, molding or silica) and **gravel**, carloads (See Note 2), from Ballina, N. Y., to Skaneateles Jct., N. Y., 67c per net ton, to apply on traffic destined to points on the Skaneateles R. R. Reason—To meet motor truck competition.

26413. To establish rate of 9½c per 100 lb. on lime, building, carloads, minimum weight 30,000 lb., and 9c per 100 lb. on **lime, agricultural**, chemical and land, carloads, minimum weight 30,000 lb., also unburnt, ground or pulverized limestone, carloads, minimum weight 50,000 lb., to Gettysburg, Penn., from the following B. & O. R. R. points: Grove, Frederick, Keller, Buckeystown, Md., Engle, Martinsburg, Millville, Natural Lime Marl Co.'s Siding, Charleston, Alba Marl Lime Co., W. Va., Stephens City, Vaucluse, Cedar Creek, Oranda, Capon Road, Strasburg Jct., Strasburg, Va. Reason—Proposed rates are comparable with rates from Martinsburg, W. Va., to Gettysburg, Penn., via P. R. R.

26414. **Sand** (1) in open-top equipment, carloads; **sand** (2) in box cars or other closed equipment, carloads (See Note 2), from South Jersey points, Group A, Winslow Jct., N. J., to Dividing Creek, N. J., inclusive; Bridgeton, N. J., to Greenwich, N. J., inclusive, rates in cents per net ton, to Plymouth Meeting to Flourtown, Penn., inclusive, proposed, (1) 160, (2) 180; to Penryn to Donaghmore, Penn., inclusive, proposed, (1) 205, (2) 230. Reason—Proposed rates are comparable with rates from and to points in the same general territory.

26416. **Sand**, blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Tatesville, Penn., to Truxall, Penn., $1.95; Vintondale, Rexis, Penn., $1.80; Rossiter, Penn., $2.43, and St. Benedict, Penn., $2.25 per net ton. Reason—Proposed rates are comparable with rates from the Mapleton district.

26424. **Common sand**, carloads (See Note 2), from Montoursville, Penn., to Williamsport and Newberry, Penn., $8.10 per car. (Present rate, 30c per net ton.) Reason—Proposed rate is fairly comparable with rates from Nisbet and South Williamsport, Penn.

26426. (A) **Building lime**, carloads, minimum weight 30,000 lb.; (B) **agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., and **ground limestone**, carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Alton to Liverpool, N. Y., inclusive, (A) 17c and (B) 16c per 100 lb. Reason—Proposed rates are fairly comparable with rates from Bellefonte to Syracuse, Charlott and Sodus, N. Y.

26435. **Sand**, molding, common or filtering, in straight or mixed carloads (See Note 2), from Pinewald, Quail Run and Toms River, N. J., to East Point, Ga., $5.25 per net ton. (Present rate, combination.) Reason—Proposed rate is same as now in effect from Millville, N. J.

26159. **Sand**, engine, molding and blast, carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., to Sheffield, Penn., $2.25 per net ton.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

22274. **Stone, crushed** (trap rock), carloads (See Note 3), from Westfield, Mass., to Worcester, Mass. Present rate, $1.10; proposed, 90c per net ton. Reason—To establish rate comparable with existing rates for like distance.

22316. **Stone, broken or crushed**, in bulk, in gondola or other open-top cars (See Note 3), from New Britain (Cook's Quarry), Conn., to Waterbury, Conn. Present rate, 85c; proposed, 70c per net ton. Reason—To meet motor truck competition.

22225. **Crushed stone** (See Note 3), from Westfield, Mass., to Brewster, N. Y. Present rate, $1.15 per net ton; proposed, $1 per net ton. Reason—To establish rate comparable with these in effect from Branford, Conn.

22247. **Stone, crushed** (trap rock), (See Note 3), from Westfield, Mass., to Albany, N. Y. Present rate, $1.30 per net ton; proposed, $1 per net ton. Reason—To place rate on same basis as sand and gravel rate from North Wilbraham.

WESTERN TRUNK LINE DOCKET

4781. Rates, **rock, bituminous asphalt**, carloads, minimum weight 40,000 lb., from Pleasanton, Kan., to stations in Colorado, Iowa, Kansas, Missouri, Nebraska and Oklahoma indexed in Missouri Pacific Tariff 1464-I, I. C. C. A-7573. Present rates, class; proposed, establish the same rates as provided from Liberal, Mo., except to points shown below, to representative points: Passaic, Mo., 4½c; Carthage, Mo., 6½c; Joplin, Mo., 6½c; Springfield, Mo., 9c; Pittsburg, Kan., 6c; Independence, Kan., 7½c. (A complete list of the excepted points will be furnished on request.)

4264. **Sand and gravel**, carloads (See Note 2), but not less than 40,000 lb., from Rock Rapids, Ia., to Sioux Falls, S. D. Present rate, $1.10 per net ton; proposed, 63c per ton of 2000 lb.

7383. **Limestone, agricultural** (for land fertilization purposes only), carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Algoa Farms, Mo., to points in Missouri. Present rates, 1c per ton per mile plus 24c per ton, with minimum charge of 61c per ton of 2000 lb. for each line handling in case of a two-line haul and 57c per ton of 2000 lb. for each line handling in case of a three-line haul, with combination of local rates as maximum per Items Nos. 290 and 1110 of W. T. L. Tariff 91F. Proposed, to add Algoa Farms, Mo., a local point on the Missouri Pacific R. R., as a point of origin in Item No. 1105G of W. T. L. Tariff 91F.

7383. **Limestone, agricultural** (for land fertilization purposes only), carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Algoa Farms, Mo., to points in Missouri.

6729. **Sand**, carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Chippewa Falls, Wis., to Herington, Kan. Present rate, 39c (Class E); proposed, 27½c.

I. C. C. Proposed Reports

23416. Molding Sand. Crane Enamelware Co. vs. B. & O. et al. Rates charged, molding sand, points in New York to Chattanooga, Tenn., inapplicable in part. Certain applicable rates found unreasonable and reparation awarded. Examiner C. Garofalo said the Interstate Commerce Commission should find that the Maysville, Ky., combination, $5.40 a net ton composed of $3.90 to Maysville, subject to the Jones combination rule, and $1.80 beyond, was applicable in the entire period covered by the complaint from Aqueduct, Saratoga Springs and Schuylerville, N. Y., to Chattanooga; that prior to November 25, 1928, the applicable rate from

Elnora, Mechanicville, Schenectady, and Ushers to Chattanooga was $5.40, but that on and after November 25, 1928, the applicable rate was $6.15; that the rate of $5.40 was not unreasonable, but that the applicable rate of $6.15 was unreasonable to the extent it exceeded $5.40. Reparation proposed.

I. C. C. Decisions

22192. **Wet-Ground Mica.** The Interstate Commerce Commission, by Division 5, in No. 22192, J. B. Preston Co., Inc., et al. vs. C. C. & O. et al.; No. 22263, Richmond Mica Corp. vs. A. C. & Y. et al.; No. 22225, U. S. Mica Manufacturing Co. vs. C. C. & O., and I. and S. No. 3346, ground mica from Richmond, Va., to central territory, upon reconsideration, has modified the finding in the former report, 168 I. C. C. 649, that rates on wet-ground mica, carloads, from Spruce Pine and Penland, N. C., to destinations in official territory, were unreasonable. The new finding is that the rates on wet-ground mica and wet-ground mica schist, carloads, from Spruce Pine and Penland to destinations on the lines of the defendants in eastern trunk line and New England territories are and for the future will be unreasonable to the extent that they exceed or may exceed by more than 15 cents the contemporaneous rates from Richmond to the same destinations on wet-ground mica, carloads, and to destinations on the lines of the defendant in central territory and points on the eastern border of that territory over routes which do not pass through trunk line territory to the extent that they exceed or may exceed 27% of the contemporaneous first class rates from Spruce Pine to the same destinations.

This modification makes unnecessary, the report says, the commodity description of mica schist, suggested in the former report. Therefore that suggested commodity description has been eliminated. Rates revised in accordance with the modified finding are to be made effective not later than June 30.

23412. **Roofing Slag.** A revision of rates on roofing slag, effective not later than June 29, has been ordered in No. 23412, Farber Sheet Metal and Roofing Co. vs. N. Y. N. H. & H. et al., and a sub-number, J. T. Maguire Co. vs. Same, from points in Pennsylvania to destinations in Rhode Island and Connecticut. The commission, by Division 2, has found the rates specified unreasonable from Reading, Hokendauqua, Swedeland and Bethlehem, Penn., to Pawtucket, East Greenwich and Rumford, R. I., and Sterling, Conn., to the extent they exceed or may exceed those made by the use of a scale and plus 70 cents a net ton for hauls involving car-float or lighterage service in New York harbor. Distances, the report said, should be computed over the routes composed or not more than three line-haul carriers by way of existing connections for the interchange of carload traffic which would result in the lowest rates taking into consideration the 70-cent arbitrary for float service. In computing the rates for hauls involving carfloat or lighterage service in New York harbor, the report said, only the actual rail distance should be used, the 70-cent arbitrary being intended to cover the entire water service. It said the prescribed rates would be required to be established only over the cheapest available routes under this prescribed scale. The report further said that the average or representative distances from groups agreed upon by carriers and interested shippers would be considered a substantial compliance with the findings. Reparation was awarded.

The scale prescribed is the same as that which was used in the making of rates in Cartier and Sons Co. vs. N. Y. N. H. & H., 157 I. C. C. 649. It begins with a rate of 150 cents for distances of over 100 miles and not exceeding 125 miles, becomes 200 cents for the block between 200 and 230 miles, and runs out with a rate of 250 cents for the block between 320 and 350 miles.

22882. **Ground Phosphate Rock.** The Interstate Commerce Commission, by Division 3, in No. 22882, International Agricultural Corp. vs. L. & N. Railroad, has found that the rate assailed was not unreasonable, and dismissed the complaint. Complaint alleged that the applicable joint rate of $8.50 from Mount Pleasant and Wales, Tenn., to Texarkana, Tex., was unreasonable. Charges were collected at the applicable rate of $5.80. In substance the complaint is that the rate assailed, which is maintained also on fertilizer from and to the points in issue, should not exceed $4.30, when tested by the phosphate rock rates maintained between points in the South.

Both origin points are on the Louisville & Nashville, hereinafter termed the L. & N. The short-line tariff routes to Texarkana are, from Mount Pleasant, the L. & N. to Sheffield, Ala., the Southern to Memphis, Tenn., thence the St. Louis Southwestern, 508 miles, and from Wales, the L. & N. to Decatur, Ala., the Southern to Memphis, thence the St. Louis Southwestern, 526 miles. Routes more circuitous by approximately 100 miles, over which some of the shipments move, are northwardly over the L. & N., from both Wales and Mount Pleasant, through Guthrie, Ky., to Memphis, and the St. Louis Southwestern beyond.

Based on the short-line distance and an average weight of 43 tons, the rate assailed from Mount Pleasant produces earnings of 49 cents per car-mile and 11.4 mills per ton-mile. From Wales the revenue yield was slightly less because of the longer distance. From Mulberry, Fla., another phosphate rock producing point, to 16 scattered destinations throughout southern territory for distances ranging from 538 to 675 miles, the crude phosphate rock rate is $4.22, yielding car-mile revenue from 27 to 34 cents, and ton-mile revenue from 6.2 to 7.8 mills. The concurrently maintained fertilizer rates from Mulberry to the same destinations range from $5.15 to $5.95. From Mulberry to 64 destinations scattered throughout southern territory, for an average distance of 557 miles, the average phosphate rock rate is $4.05 and the average fertilizer rate is $5.33, the average revenue being 33.9 cents per car-mile and 7.8 mills per ton-mile on the phosphate rock and 26.7 cents per car-mile and 10.6 mills per ton-mile on the fertilizer. From Mount Pleasant to 64 destinations in southern territory, an average distance of 434 miles, the average phosphate rock rate is $3.56, yielding average revenue of 37.8 cents per car-mile and 9.3 mills per ton-mile. The fertilizer rates from Mount Pleasant to these destinations average $4.68 and yield average revenues of 30.4 cents per car-mile and 12.1 mills per ton-mile. The average car loading of the manufactured fertilizer is but 25.1 tons per car.

Colorado Cement Manufacturers Protest Freight Rates

COMPLAINTS were filed March 30 by the Colorado Portland Cement Co. and the Three Forks Portland Cement Co., both having general offices in Denver, Colo., with the Interstate Commerce Commission against rates on cement to points on the Wyoming railroad in that state.

Rates to points on that line from mills at Portland and Boettcher, Colo., and Hanover and Trident, Mont., are declared to be greatly in excess of freight charges from mills in South Dakota, Colorado and Nebraska.—*Denver* (Colo.) *Post.*

Canadian Government Lowers Freight Rates on Agricultural Lime and Limestone

AS THE RESULT of a movement to encourage the greater use of lime in agriculture, particularly in those sections where soil corrective is required to stimulate more economical production of farm crops, Ontario farmers will enjoy a great reduction in the transportation cost of pulverized limestone, it is announced by Hon. T. L. Kennedy, Ontario Minister of Agriculture.

The Canadian National and Canadian Pacific railways have agreed to reduce the present tariff on the pulverized limestone to be used by farmers, to the amount of 25%, and the provincial and dominion departments of agriculture, in co-operation, will grant further subventions to the combined amount of one-half the remaining freight rate, with a maximum of $1 a ton. Substitutions will be granted screenings.

About 3½% Decrease in Stone and Gravel Car Loadings Predicted

CAR LOADINGS OF GRAVEL, sand, stone and cement probably will be less during April, May and June than they were during the second quarter of 1930, but the decrease in these loadings is not expected to be as great as the decrease in loadings generally, according to reports to the American Railway Association by shippers' advisory boards from all parts of the country.

Reports of the boards, which are made up of shippers representing virtually every commodity shipped, on 29 principal commodities indicate a decrease of 5.8% in car loadings during the second quarter of this year.

Loadings of gravel, sand and stone are expected to decrease about 3.6%, according to the reports, while loadings of cement are expected to decrease 5.2%.

During the second quarter of 1930 loadings of gravel, sand and stone amounted to 756,755 cars, whereas the estimated loadings for this year are 729,730 cars. Cement loading is expected to drop from 206,570 cars to 195,874 cars.

Loadings of brick and clay products are expected to decline more than the average for the 29 principal commodities. The figures are expected to drop from 137,839 in 1930 to 127,733, or 7.3%.

Lime and plaster shipments also are expected to drop from 52,450 cars in 1930 to 47,328 cars during April, May and June this year, a decline of 7.2%.

Washington Safety Meeting Successful

Cement Mills of Chesapeake Region Get Together on March 10

THE cement mills and quarries of Virginia, Maryland and southeastern Pennsylvania held their annual safety conference under the auspices of the Portland Cement Association at Hotel Raleigh, Washington, on Tuesday, March 10. Representatives of the mills of the Lehigh Portland Cement Co. at Fordwick, Va., and Union Bridge, Md., the Lone Star Cement Co. Virginia mill at Norfolk, quarry at Chuckatuck, Va., and packing plant at Washington, the Medusa Portland Cement Co.'s plants at York, Penn., and North American Cement Corp. mill at Hagerstown, Md., and lime works at Martinsburg, W. Va., were present and participated in the meeting.

W. M. Powell, safety director of the Medusa Portland Cement Co., acted as general chairman, while A. R. Couchman of the North American Cement Corp. acted as luncheon chairman. George F. Martinez, superintendent of the Lone Star plant at Norfolk, Va., served in that capacity at the afternoon session. A number of valuable papers were given during the day by men from the different plants, and the high spots of these are reproduced in connection with this report. A dinner was held in the evening presided over by A. J. R. Curtis of the Portland Cement Association, who presented the first-aid trophy to the team representing the North American Cement Corp., Martinsburg, W. Va.

Making Safety Mass Meetings Effective

By A. R. Couchman, Safety Director, North American Cement Corp.

Some time ago, while engaged in a discussion of various ideas and activities with a plant executive, he stated that plant mass meetings were all right occasionally, but that they gradually become monotonous. If they do, it is my fault or your fault. These meetings can be made interesting and effective and will contribute more to the education of the mass of employes to the safety habit than any other factor in your safety work. But if they are allowed to become boresome or monotonous the reaction certainly will be negative.

You would not care to hear and see the same motion picture over and over again each week or to hear the same talk on the same subject. This same attitude is characteristic of our mass of employes, when we bring them together on periodical occasions without diversifying our program. The success of these meetings depends upon the following factors:

1. Type of speaker.
2. Type of talk or program.
3. Length of program.

W. M. Powell

The following suggestions are made as a guide to improving and diversifying your meetings to make them more effective:

1. Set up a tentative program of meetings for the entire year.
2. Actively identify plant managers, superintendents and supervisory forces with the programs.
3. Develop foremen as speakers.
4. Alternate chairmen at various meetings.
5. Develop workmen as speakers.
6. Interchange speakers between plants.
7. Arrange occasional talks by the plant physician.
8. Procure outside speakers occasionally.
9. Hold illustrated short sketches at occasional meetings instead of having a speaker.
10. Procure local publicity featuring the various programs and speakers.

The program for mass meetings should be prepared prior to or at the beginning of the year and should become an integral part of the safety program. The number of meetings is usually governed by local conditions. I know of some plants who hold departmental meetings weekly, some semi-monthly, while others hold entire plant meetings monthly. I find by dividing the plant into two sections, the mill covering one section and the quarry the other, and planning the program for semi-monthly meetings, alternating from one section to the other, makes a very satisfactory arrangement. After the program has been started it should be continued and care should be taken not to let too many things interfere with holding them on schedule. An excuse for postponement today may mean another excuse for postponement tomorrow. The same is true of the employe with regard to attendance. His interest is brought about by habit formed for looking forward to these meetings, and if they are allowed to lapse he is going to become disinterested. The consequence will be two sided, because you as the sponsor will gradually lose interest and that personal contact which contributes so much to the ultimate success of the safety program will be broken and psychological effect will be destroyed.

The superintendent and plant manager have important roles to play in the success of these meetings: while they should be featured occasionally as the speaker of the occasion, their presence at all meetings when possible is essential, because their regular attendance not only proves their sincerity and interest, but it is carried down the line into the ranks. A few words of encouragement coming from the executive staff at each meeting adds much to a far-reaching effect.

One of the most helpful things that can be done in connection with the mass meeting program is to introduce a series of illustrated sketches.

Here are some suggestive subjects:

(a) Investigation of a serious or near accident.

(b) First-aid demonstrations.

(c) Demonstration of the fundamentals of first-aid, taking one at a time until all have been covered.

(d) Illustration of the effect of an infected wound.

(e) Movie slides and films featuring various things of interest.

(f) Feature various safety rules by illustration.

Illustrated sketches if properly staged and conducted will be very impressive. It is true they require some little time for preparation, but the effort is well worth while and the effect will be far-reaching not only in increasing interest but diversifying the program as well.

Safeguarding Employes During Construction

By J. H. Zaiser, Chief Engineer, North American Cement Corp., Hagerstown, Md.

Safeguarding employes during maintenance is largely a matter of enforcement of rules and procedure set up for maintaining equipment. In construction, which

is more hazardous, most of the rules can be applied, but in most cases the men in charge have to be "safety engineers" and plan their work in a safe way, as conditions are constantly changing.

Some rules and suggestions that tend to safeguard during maintenance and construction are as follows:

Have locking devices on all machinery, using switches and locks with individual keys. Then instead of giving instructions that may be misunderstood or forgotten, simply lock the starting switch. It requires only a moment and represents absolute protection.

Guards are placed around machinery or on dangerous passageways to protect human beings from personal injuries. If they are removed or if for any reason they fail to give 100% protection, they are not fulfilling their purpose.

The worker who wears proper goggles enjoys full eye protection.

When a hammer or sledge strikes the mushroomed head of a chisel or other tool, small particles of steel are apt to fly off. They may strike someone in the eye. Mushroomed tools should be turned into the tool room for dressing. Also hammers or sledges with broken handles, or wrenches not in proper condition, should be promptly repaired.

The best means of protection for your toes is safety shoes. A mashed or broken toe too generally means a loss of time. Safety shoes are little different from other shoes except that they have enclosed in them strong boxes to protect the toes.

Especially around construction work is there danger in falling objects. Handling materials above ground carries a heavy responsibility. Falling tools often cause serious injuries and the hazard of dropping material which is being lifted or carried. Good housekeeping, common sense and constant watchfulness will go far in solving this problem.

A weak link can mean but one thing: a weak chain. A faulty piece of hemp invites disaster in a rope. A weak strand of wire also invites disaster in the use of a cable. Chain and cables will seldom break when there is a rigid and regular inspection.

The good housekeeper has a place for everything and keeps everything in its place. Good housekeeping is largely an individual proposition, carrying with it an individual responsibility.

Investigation of Fatal and Serious Employe Accidents

By C. E. Eichelberger, Quarry Superintendent, Lehigh Portland Cement Co., Union Bridge, Md.

I believe that a committee should be appointed especially to conduct accident investigations. It should be carefully selected from men who are respected by the entire plant personnel and who are sincere, honest, intelligent, just, and fully capable of good sound analytical reasoning. This committee should have available a stenographer who is capable of taking down all testimony verbatim, because the most important part of the investigation may be lost if it is not recorded.

When a fatal or serious accident has occurred, this committee should begin to function at once. The first step is to arrange a conference with the department head where the accident occurred. It is advantageous to have him pave the way for the witnesses. After the foreman's

George F. Martinez

testimony has been recorded, he should accompany the committee to the scene of the accident. All witnesses should be interviewed, and all the details of the site of the accident and the conditions should be carefully noted. Record even the smallest bit of information that may be obtained. Each member of the committee should study in an individual way all the testimony and every phase of the accident. After this has been done, the committee should meet and discuss the occurrence, and at this time assemble all useful information and discard that which is not needed. The next step is to call a meeting of the entire committee; the departmental foremen, important witnesses, and the victime of the accident, if possible.

It is necessary that the committee use tact, and place the whole assembly at ease. The purpose of the meeting is to find the cause of the accident and prevent a recurrence. If the men become suspicious and think you are trying to incriminate them or their fellow workmen, you probably will not get the information being sought.

My reason for the two sessions is because when an accident has just happened there is always confusion and excitement, and some things, though said in a truthful manner, are not correct statements, and it will be found that by the use of the second meeting one will get a more complete and accurate picture of the accident.

The committee's report should cover completely three phases of the accident:

First, a complete description of the accident.

Second, an analysis as to cause, naming those responsible.

And, third, complete recommendations, the compliance which will eliminate repetition.

The report should then be put to use. Slides or pictures can be made, or possibly moving pictures or charts. Then through safety meeting the details can be so explained or presented that the men may derive a great deal of benefit.

Investigation of Accidents

By E. S. Guth, District Manager, North American Cement Corp., Hagerstown, Md.

We have set up a system of investigating accidents and have made it a regular part of our safety program. We have a committee consisting of a plant executive as chairman and three other persons of equal rank, one of whom acts as secretary. The committee is instructed to be open-minded on all matters of investigation, to procure facts unbiased by personal opinions and to avoid antagonistic point of view. In other words, the investigation is limited to facts and not matters of opinion.

When an accident occurs, efforts are frequently made to show that it was due to bad luck and could not have been avoided. We instruct our investigating committee to be very careful to avoid this attitude and to show the organization how it could have been avoided, had sufficient foresight and care been used, and to keep a strictly impersonal and judicial point of view and avoid any appearance of seeking a scapegoat.

We try to investigate all accidents as soon as possible. The committee first interviews the foreman and witnesses and then visits the scene of the accident. If it is serious we take a photograph or have a sketch made of the location.

The committee then reports, making the following the substantial factors:

First: To establish an accurate record of all connecting facts concerning the accident.

Second: To place the responsibility of the accident upon the proper person or persons.

Third: To arrive at recommendations for prevention of repetitions.

Fourth: To promote safety education among those involved.

Proper Training of the New Employe

By H. A. Leonard, Foreman, Medusa Portland Cement Co., York, Penn.

Explanation of company policies, introduction to work, rules which apply to his work, and accident hazards, are some important points to be covered in the instruction and training of the new employe.

It is not enough that an applicant know his individual job only. An understanding of the policies of the company is most important in keeping an employe satisfied with his work. These policies should be explained in order that he may know what to expect in the way of advancement, life insurance, annuity or pension, sick benefits, recreation, etc. It may be easy enough to place a man on the job, but if he is a desirable employe you will want to keep him in the service. Particular emphasis should be laid on the company's policy with reference to accident prevention, service, public relations, and safe operation.

He should then be sent to the safety director, who should acquaint him in detail with the safety organization, plans for accident prevention work, and the most important rules. Care should be taken to properly impress him with his personal interest and responsibility. He should be told what his safety means to him and his family, and how essential it is to their welfare and happiness. He should also understand his responsibilty for the safety of his fellow employes and the protection of the public. Much of his future cooperation in accident prevention will depend upon his understanding of these responsibilities and his understanding of the safety director's interest in him. In some cases it has been found beneficial for the safety director to further talk with the new man after his "breaking in" period, with a view towards checking up on his understanding of safety rules and responsibilities.

Some competent person should in every instance carefully explain the work he is to do and any hazards in connection therewith. Afterwards his work should be closely observed to see that he has the correct understanding of his job and the ability to do the work.

The work of the new employe should be closely and carefully observed and supervised, and the following points kept in mind: (a) Willingness to learn. (b) Freedom from handicaps. (c) Opinion of others. (d) Close supervision.

If he displays tendencies to take unnecessary chances he should be carefully admonished before an accident occurs. If such observation and supervision reveal his unwillingness or inability to acquaint himself with and observe safety rules and orders, he should be taken out of the service. If he proves himself worthy of permanent employment in the organization he should be examined periodically as to his knowledge of the company's rules.

All employes should be asked to assist in watching the work of the new man, and their opinion as to his ability and attitude should be constantly sought. This should be supplemented and verified, however, and first-hand information should be secured before any action is taken.

Training of Employes

By E. E. Anderson, Repair Department, Lone Star Cement Co. Virginia, Norfolk, Va.

Man is not naturally "danger conscious." It requires a narrow escape or an accident to jar us into danger consciousness.

In safety education, some men advance rapidly, while others, either from a spirit of carelessness or from difficulty of absorbing information, have to be jolted into obeying the rules. It is not contended, of course, that all accidents are due to carelessness, or dullness, as accidents that are unavoidable sometimes occur. New hazards arise from time to time, and, as in the case of new diseases, new methods of treatment and prevention must be used.

More important than selection of workmen is the selection of the men for the training of the new men. The most important single qualification in supervsion is to be able to recognize and appreciate good work.

Nothing kills loyalty quicker than criticism or indifference from those in authority when a man is doing a good job quickly and efficiently. Appreciation does not cost anything, and is more effective than a raise in pay.

A foreman who is 100% loyal himself will do more, by example, than all the preaching he may do on the subject of loyalty.

Individually, one need not endorse every decree handed down from higher authority, but, nevertheless, the decree may be just and deserve support. The man higher up as well as the man lower down is entitled to co-operation in his work. Refuse co-operation and co-operation will be denied in return.

Training a new man is easier if the standard is already high among the older employes. The new man comes in anxious to please, and, although he is under observation, he is doing some observing himself. He is not going to obey any rules that the old heads ignore, and, by the same token, he is going to start right out in proper step if he sees the whole organization marching in time.

New Safety Idea Put Into Practice Last Year

By W. G. Skinner, Chemist, Lehigh Portland Cement Co., Union Bridge, Md.

This idea is part of the superstructure built upon the practice of general first aid training for plant employes of the Lehigh Portland Cement Co. at Union Bridge, Md. It was put into practice by our superintendent last year. It may be called the "Three Principal Points in First Aid Training" and includes, (1) stopping and controlling arterial blood flow; (2) properly removing a victim from electrical contact; and (3) the prone pressure method of resuscitation. Each employe must know these points, and know where, how and when to apply them as first aid measures.

New men on the job are under the control of a first-aid captain, until they have received first aid training and are proficient in the three principal points of first aid, as far as instructions and coaching can make them so.

Our general method for putting over this training is made clear from the following:

We have two first aid teams, one in the quarry and one in the plant. The personnel of these teams comes from scattered sections of the mill and quarry. The plant team has its headquarters in the storeroom. These teams have special qualifications obtained by persistent study and practice of the problems suggested in the first aid manual. Each team consists of six members, including the subject on whom they intend to work; and both teams alike meet at least once a week and exemplify the first aid manual problems in all their details, including the importance of tying proper knots, proper folding of bandages, how to and how not to apply them; and what to do and what not to do in case of an accident, before the doctor arrives.

The two first aid teams who receive this special training are changed, practically speaking, every year. Our superintendent changes the entire personnel except for one man who is made captain of the next team. This is done at the beginning of each operating year. The change is made with the idea of extending as far as possible the special benefits that come from the intensive training received.

At these regular first aid meetings, besides being a practice for the team in the points of first aid to make them more proficient when they are called on for actual work, there are present those new men or those who may not have received all of the details as to how to render first aid to the injured. Here the latter men see and talk about the details of first aid and then learn to remember without help how to apply the three principal points already mentioned.

After these men receive the required instructions and training, they go to our chief instructor for his handling. He has given much study, time and practice to exactness of details in first aid work, and is our general examiner on these points. The employe is sent to him for final O. K.

Novel Method for Improving Safety Efficiency

By H. G. Williams, Chief Clerk, Lone Star Cement Co. Virginia, Norfolk, Va.

With the object in view of improving our safety status we have been developing and working on a plan of safety enforcement at

the Norfolk plant that has shown pleasing results in the past four months. This plan is responsible for greatly improving the efficiency of the safety organization. It has virtually put safety on a self-governing basis with us.

The plan consists of applying a penalty fine of 25c against any member of the plant organization when found guilty of an unsafe or careless practice. All members of the organization, no matter what their position, are subject to this penalty. To put the plan across required securing the voluntary consent of all to try the plan out, and their promise to back it with their full co-operation.

The outline of organization is as follows:

First, we have the complaint committee, to whom all complaints on unsafe practices are referred. Second, the departmental court for trying the case. We find it better for each department to try its own members rather than by a separate court, or by members of another department. Third, the supreme court to handle unusual cases, or trial of foremen. The safety committee and superintendent comprise this court.

As a result of establishing a penalty for failure on the part of any and every person to maintain safe practices, there has been a tremendous effect upon improving safety efficiency and reducing minor accidents. After a few offenses and application of the penalty it is surprising how unsafe practices and minor accidents have fallen off. For instance, glasses are always in use by repair men, machinists, packers, etc. Otherwise, it costs the offender a quarter. Foremen now have their accident reports and doctor's reports in on the dot; routine work, and monthly reports are right up to schedule, or they are subject to a fine.

Mass Meetings Have Proven Greatest Help

By S. C. Kohs, Chief Electrician, Medusa Portland Cement Co., York, Penn.

One new idea used at all our plants has proven to be more effective than any other idea used. This idea is perhaps not entirely new to all, but to us it is.

The frequent mass meetings held every three or four months, either at the plant if suitable quarters are available or in a public hall or building where the employes, with their wives and children can all attend, have been the means of spreading the gospel of safety better than by any other means so far conceived.

Good speakers, many from the ranks, others hired, hold the attention of the audience. Good music is furnished, either from talent among the employes or a hired band or orchestra. Refreshments are served at the end of the meetings and a good time is had by all. These meetings do not cost the employe one cent and give them good wholesome amusement, good sound advice and something to eat. It gives them a chance to relax and forget their worries and puts them in a better frame of mind the next morning when they return to work.

The talks on safety are attentively listened to and have their effect because it makes men think and especially when their wives any children are with them.

The presence of the wives at these meetings has a very important influence on the attitude of the husband or sons. Woman's influence over man is well understood and it is just as influential on safety matters as on other subjects. Children, too, are much impressed by what they hear and see and these impressions bring results. In their play or on their way to school or on errands they are more careful and realize many of the dangers all about them. The full effects of these childhood impressions are bound to show up in later years as they grow older.

Since there are as many accidents within the home as there are in industry the message of safety to the families of the employes will eventually show the same reduction in accidents in the home as has been shown in industry.

Another very noticeable benefit from these meetings is that the various families of the employes come in contact with one another and become better acquainted. There is closer friendship among the men which stimulates better co-operation in their work, the result being greater efficiency, larger production and lower cost, all of which are important, in that the lowered costs due to greater efficiency benefit the company and less lost time is a benefit to the employe because his financial losses are reduced and his greater efficiency makes him more secure in holding his job. The more a man feels that his job is secure the more efficient he will become.

Safety Work Gains Steadily

By W. T. Law, Master Mechanic, Lehigh Portland Cement Co., Fordwick, Va.

The guarding of a plant without the education of the employes is of little value—the education of the employes without the guarding of the plant perhaps is of a greater value but still is not the goal to be attained, it is only where the two go hand in hand and with the backing of the executives of a company, the interest and support of the superintendent, the education of the foremen and the men that plants can expect to operate safely and economically.

In the early days it was thought foolish to report every bruise and scratch and the rough hardy men around the cement plants felt that it was childish to have these ordinary bruises and scratches attended to, with the result that infections continued. However, through education, the use of bulletins giving the story of one of their own employes, brought results and today any man who fails to report an accident no matter how slight is not obeying the rules of the company and is not playing square with the men in his own organization.

In our own organization, and this is over ten years ago, the management stated definitely that a foreman was just as much responsible for the safety of his men as he was for production. When this responsibility was realized by all foremen a very noticeable improvement took place. Foremen began to assume this responsibility and they began to see that fewer accidents meant better production, lower cost, more satisfied men. The morale increased in their departments and with the increase of the morale in all departments it meant a better morale in the plant, and with a better morale in all plants it meant a general *Esprit de Corps* throughout the organization.

In the old days there was perhaps one mass meeting a year—having safety talks and then forgetting about it until the next meeting, but this is a thing of the past. Today every foreman has the opportunity of reading the National Safety News, the Safe Practice pamphlets and every safety committeeman receives a copy of the Safe Worker, also a copy of the Accident Prevention bulletin of the Cement Association. Copies of all these magazines are supposed to be kept in the safety library for the use of the safety committee. It has been found that where the foreman holds a monthly safety meeting with the men in his department (if only for ten minutes) bringing up the subject of safety and ways of improving operation, calling attention to unsafe practices, etc., in every one of these departments improvements have taken place. This is known to be true.

In 1925 with eighteen Lehigh mills operating, each divided into sixteen departments, which would make a total of 288 departments in all plants, we find that 114 of these departments had lost time accidents. Due largely to our campaign of education and the departmental safety meetings our record in 1930 shows that of 224 departments operating during the year only 14 departments had any lost time. Thirteen quarries out of fourteen had a clear record. The Raw Department in all plants had a clear record in 1927-1929-1930. The Coal House in all plants had a clear record in 1929-1930. The Repairmen in all plants had a clear record in 1929-1930. Bag House and Store House in all plants had clear records in 1926-1929-1930.

These figures speak for themselves and the results we have obtained by having every foreman look after the men in his own department, keeping the personal contact, handling them as men, gaining their confidence and selling them the idea of accident prevention has been one of the greatest factors in our organization.

It is true that clean attractive bulletin boards with fresh new posters two or three times a week have helped in this plan of education. June Safety Campaigns, the competition between mills, all of these things have helped to develop the attitude of mind of the men along safety lines.

Milwaukee County Sand and Gravel Producers Invoke State Co-operative Marketing Law

WISCONSIN'S co-operative marketing law has been invoked by Milwaukee county sand and gravel producers in an effort to stabilize their market and establish fair trade practices. Producers, operating under the name of the Sand and Gravel Co-Operative Association of Milwaukee county, have organized and will start functioning, Otto Lutz, president, announced recently.

As explained by Mr. Lutz and other sand and gravel pit operators, the need of a co-operative association was felt to be imperative after the disastrous 1930 season. Competition brought on price cutting on such a wide scale that all of the firms had losses.

Draft Fair Trade Rules

Between 25 and 35 producers and dealers have signified their intentions of joining the co-operative. They have drafted a code of ethics, defining fair trade practices, and have filed their rules with the department of agriculture and marketing, which sponsored the movement.

The code establishes a uniform price for all sand and gravel products and is just as binding upon independents as it is upon the members of the co-operative. Any attempt to cut prices below the minimum fixed by the association will be reported to the state and, if necessary, orders to desist will be issued. Refusal will result in action to enjoin the independent or organization member who refuses to abide by the code.

As the result of the co-operatve move, 1931 prices for sand, gravel and crushed stone wll be advanced between 20c and 35c a cu. yd. over the competitive prices of last year, but they will be $1 or more lower than schedules fixed two years ago when the Mineral Aggregate Association still existed.

Supervise Independents

"If any sand and gravel dealers refuse to join the co-operative we cannot force them to do so," one dealer said. "Each member's books will be subject to audit by the association, and independents, if they are reported to have violated the code, will be subject to scrutiny by auditors of the department of agriculture and marketing."

Under the code each member will manage his own business as formerly, bid on furnishing materials to building contractors and deliver the products as he always has done. They will be permitted to sell higher than the minimum price, but not lower.

One dealer predicted that one of the results of the co-operative system will be better pay for workers at gravel pits and independent truckers who haul the commodity to jobs.

Expect Fair Profits

"Stability of the market will assure us of a fair profit where competition not only cut the profits but left all of us in the red last season," he said. "A share of the profits will be passed on to our employes and to truckers."

The officers of the association are Otto Lutz, president; Louis Garrity, vice-president; A. A. Retzlaff, secretary, and Henry Jaeger, treasurer. The board of directors includes all of the officers and W. Palmer, Hartland, Wis.; Walter Hartung, Herman C. Luedke, Bruno Kaestner and A. D. De Vos.

City Must Pay Higher Prices

The city's sand and gravel contract cannot be continued into 1931, because it legally expired at the end of 1930, according to an opinion given by C. W. Babcock, assistant city attorney.

Therefore the city will have to buy its sand and gravel in the open market at prices from 3 to 25c a cubic yard higher than last year's. The Sand and Gravel Co-operative Association has set minimum prices below which its members may not sell.

J. W. Nicholson, city purchasing agent, said that the city would have to spend about $10,000 more.—*Milwaukee* (Wis.) *Journal*, March 27.

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But Here Is the Sad Sequel

The sand and gravel dealers' price cutting is on again, and this time it promises to be a "war that the little boys will not be able to stand," according to one dealer who had tentatively subscribed a week ago to a minimum price agreement.

Between 25 and 35 dealers 10 days ago formed what was to be known as the Sand and Gravel Association of Milwaukee county, and agreed on a price schedule which would have been 20 to 25 c. a cubic yard higher than the 1930 prices.

Code Drawn Up

A code was drawn up, whereby none of the members was to bid less than the minimum fixed. The new price schedule was to have gone into effect last Monday.

A new meeting was held this week, at which it was decided to "let the matter drop," it was reported Thursday by William Clow, president of the Waukesha Lime and Cement Co., who attended part of the meeting. Mr. Clow was not among those who had joined the association.

"Several dealers," Mr. Clow said, "already are quoting prices under the 1930 schedules, which were so low that nearly all the companies operated in the red.

"Some prices indicate the beginning of a war that seems to threaten disaster to any one who tries to operate under them. The new scales will be reflected Friday in the bids to be opened by the department of public works, which include paving involving use of about 50,000 cu. yd. of sand and gravel."

The state department of markets, which had been fostering the co-operative association move, will make another effort, it is understood, to bring the dealers together on a price schedule. The state is interested in the case because if the industry makes no profits it will return no income tax revenue. —*Milwaukee* (Wis.) *Sentinel*, April 3.

California Gravel Co. Given Permit for Asphalt Plant

AN ORDINANCE was adopted by the Van Nuys, Calif., city council granting the Consumers Rock and Gravel Co. a permit to establish an asphaltic concrete plant at 12201 Sherman Way. Residents of the district protested in vain against the granting of this permit, and insist that such a plant is a nusiance and tends to destroy property values in the neighborhood.—*Van Nuys* (Calif.) *Tribune*.

American Aggregates Buys Another Indiana Plant

PURCHASE of the Maxwell Gravel Co., Indianapolis, Ind., by the American Aggregates Corp. was announced recently by C. (Dolly) Gray, manager of the Indianapolis district of the latter concern. Although the sale has not been completed, Mr. Gray said it would be within a week or ten days and his company will then take over the Maxwell ground and equipment.

The Maxwell concern, with which Charles S., M. G. and Howard Maxwell have been associated, will release to American Aggregates its two pits along State Road 31, just north of Broad Ripple and across White River, and all its equipment, under terms of the pending contract.

Mr. Gray said equipment in the Maxwell pits will be remodeled and used through the summer, but that next fall a new dredge boat and system will be put in. The American Aggregates Corp. will have three pit units in the city when the deal is closed, Mr. Gray said.—*Indianapolis* (Ind.) *News*.

Western Pennsylvania to Have New Gravel Plant

JOHNSON BROTHERS of New Castle, Penn., recently purchased a sand and gravel bank on the Coulter farm south of Grove City. Work is already under way in taking out modern supply material for building purposes.

H. R. Johnson is well known here, having been for many years the superintendent of Pittsburgh Limestone Co. at Hilliards.—*Grove City* (Penn.) *Reporter-Herald*.

A. S. T. M. Committee on Gypsum to Revise Specifications

AT THE MEETING of Committee C-11, held at the Bureau of Standards, Washington, D. C., on March 26 and 27, the results of tests on gypsum board products conducted by various members of the committee were reported. Based on these tests the committee intends recommending at the June meeting of the society a proposed revision of the present standard specifications for gypsum plaster board (C 37-30) and gypsum wall board (C 36-25), as well as a revision of the present tentative specifications for gypsum sheathing board (C 79-30 T).

Additional reports were submitted on the suitability of the modified vicat apparatus for the determination of standard consistency of wood fiber and ready sanded plaster which look very promising. It is felt, however, that further investigation is necessary before recommending its adoption as standard.

So far the committee has been unsuccessful in its efforts to find a positive accelerator of constant composition to be used in place of standard Ottawa sand in the determination of time of set of gypsum wall plaster. Further investigations are being conducted, however, and reports will be submitted at the fall meeting.

Additional reports were submitted on the investigations being conducted to find some simple, definite means of determining the sand content of set plaster. This problem also requires more investigative work, which is being carried on by several members of the committee.

Waterbury, Conn., Ready-Mix Concrete Plant in Operation

THE WATERBURY READY-MIXED CONCRETE CO., Waterbury, Conn., opened its new plant at 94 Benedict street, March 31. The officers of this new firm are J. F. Smith, president; J. S. Barbara, vice-president; B. S. Chatfield, treasurer; H. W. Brown, secretary; J. De Lauritis, manager.

The new plant is located directly adjoining the railroad tracks. A large grate over the tracks allows carloads of sand or crushed stone to be dumped into conveyors which automatically carry it to the storage bins which have a capacity of 400 tons. Cement will be received in bulk and taken into the cement bins through a pipe by suction. There are three large bins for storing cement, each with a capacity of two carloads.

Scientific weighing and measuring devices permit the desired quantity of cement, sand and crushed stone to be dropped into a hopper, from which it is dumped into the delivery trucks. The trucks have rotating bodies and blades and carry a tank of water and the concrete is mixed en route to the job.—*Waterbury* (Conn.) *Democrat.*

Nelson S. Greensfelder Dies of Pneumonia

NELSON S. GREENSFELDER, advertising manager of Hercules Powder Co., Wilmington, Del., died April 5 after a brief illness which quickly developed into pneumonia. The news of his death will come as a shock to his many friends in the quarry industries, particularly in the National Crushed Stone Association, in the activities of which he always took a prominent and helpful part. He was one of the founders

Nelson S. Greensfelder

and the first chairman of the Manufacturers' Division of the Association; and in more recent years was particularly active in promoting the Association's safety contests.

Mr. Greensfelder was born in St. Louis county, Missouri, March 20, 1891. He attended Colorado College and later the Colorado School of Mines, graduating in 1913 as an engineer of mines. He entered the employ of Hercules Powder Co. as a salesman and demonstrator and upon showing ability as a writer and advertiser was transferred to the home offices in Wilmington. He became advertising manager in 1924.

A number of his activities brought Mr. Greensfelder into national prominence. One of the organizers of the National Industrial Advertisers' Association, he became its president and represented the organization at the world advertising institute in Berlin, Germany, in 1929.

He was director of *The Explosive Engineer*, published by the Hercules Powder Co., a magazine of international circulation sponsoring safer and better methods of using explosives. Through *The Explosives Engineer* he was instrumental in instituting the National Safety Competition, annually awarding trophies to the winners of this competition. Under the U. S. Bureau of Mines, this safety movement has been responsible for wide reduction in industrial accidents.

Mr. Greensfelder was active in Boy Scout work and was to have represented Delaware at the National Scout Council in Memphis, Tenn., in May.

Other groups in whose activities he took a prominent part are American Mining Congress, American Institute of Mining and Metallurgical Engineers, National Safety Council, Pine Institute of America, Institute of Makers of Explosives and Association of National Advertisers.

Locally, Mr. Greensfelder belonged to several service clubs and to the Masonic order and was active in the Wilmington Chamber of Commerce.

He is survived by his wife, Grace Gleason Greensfelder, and 7-year-old son, Robert J., and his parents, Judge and Mrs. J. B. Greensfelder, Kirkwood, Mo.

California Lime Products Buys Quarry Site

THE CALIFORNIA LIME PRODUCTS CO. has purchased limestone properties and a mill site, comprising 145 acres, on the main line of the Southern Pacific Co. near Towle, Calif., for a consideration of $125,000. The properties were acquired from Vivia Hemphill of Roseville.

In making this announcement recently, R. E. Mittlestaedt, president of the company, said the deposits constitute the largest and most accessible in the state.

Work of opening the quarry will start at once, so the company may produce solid carbon dioxide, agricultural lime, chicken grits and other lime products at a plant to be constructed near Sacramento. Mr. Mittelstaedt said the project will give employment to 100 men.

The principal offices of the company are in this city, with sales offices in San Francisco.—*Sacramento* (Calif.) *Bee.*

Now the Bucyrus-Monighan Co.

AT THE ANNUAL meeting of the Monighan Manufacturing Corp., Chicago, Ill., makers of walking dragline excavators, it was voted to change the corporation name to Bucyrus-Monighan Co. The new company will continue to operate as a separate organization exactly as the Monighan Manufacturing Corp. has in the past except that sales will be handled by the Bucyrus-Erie sales organization. W. W. Coleman was elected chairman of the board and G. A. Morison vice-chairman. In addition the old officers were re-elected: O. J. Martinson, president; W. T. Brennen, vice-president and treasurer, and H. W. Voss, secretary. E. K. Swigart and W. M. Bager of Milwaukee and T. H. McGowen of Chicago were elected directors.

Foreign Abstracts and Patent Review

Drag Scrapers for Limestone Quarries. C. Berninger states that the Porta plant of the Wicking Portland Cement and Hydraulic Lime Works is located at the foot of the Weser mountains. Limestone strata consisting of many banks extend in a thickness of many feet from the valley floor up to the Jakob mountains. This deposit is exposed

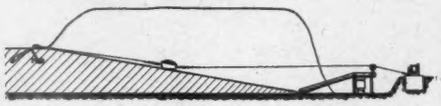
Drag scraper starting to take load of limestone

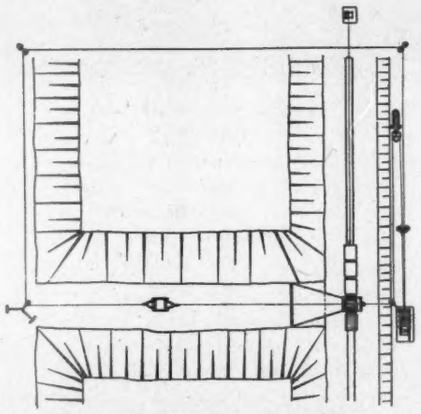
near the top and further down the overburden is only from 3 to 7 ft. deep. The overburden is removed in small cars run on narrow-gage tracks, while the limestone had until the present been loaded by 20 men into 2-yd. trucks and hauled down the slope on railway track by aid of an electric winch.

Drag scraper on loading platform waiting for car to load; bridge for hauling overburden in background

In order to reduce the operating costs it was decided to install a drag scraper or scraping loader. In this installation an iron bucket having no bottom and consisting of two side walls and a razor-blade shaped back is drawn by cables operated by a powerful winch over the pile of blasted limestone. Due to its weight and due to its peculiar shape, this drag scraper digs into the mass of rock and scrapes it ahead of it until at the end of the scraper track it is raised on a slope to an iron platform above car level so that its contents can drop through a hole in the platform into the waiting car. About 45 cu. ft. of limestone can be hauled on each trip.

The drag scraper is operated in a direction at right angles to the direction of the track. The 70-hp. drag scraper winch is located on a masonry foundation. On a foundation about 65 ft. in front of the winch is located a so-called shock absorber, an air bumper connected to the compressed air line which supplies the compressed air hammers. This air bumper absorbs the sudden shocks caused by the sudden draw of the drag scraper on the cable.

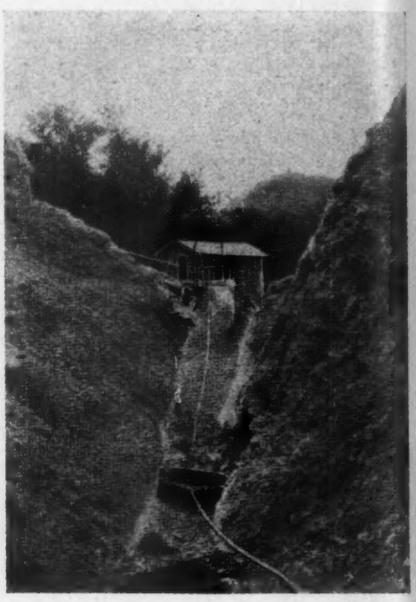




Plan and elevation of the drag scraper plant

The scraper loading cable runs from the winch drum around the shock absorber drum, returns to a second drum in the hoist house and leads over the loading platform to the scraper. The return cable runs from the back of the scraper over three guide pulleys secured to a tree or anchor to the other winch drum. The return drum runs at a higher speed to effect a quick return motion of the scraper. The planet coupling on the winch permits a very slow forward movement of the scraper, which is of advantage in filling a nearly filled car.

One man operates the scraper plant by use of a single control lever, and one man operates the winch hauling the car train, communication being by electric signal. While the scraper is in operation, two or three men operate the rock drills, and they set off the blasts while the scraper is unloading. The scraper path is about 200 ft. long and 90 seconds are required by the scraper for a complete forward and return movement, so that a train of 10 cars of 70 cu. ft. content each can be filled by 13 to



Drag scraper moving with load to loading platform

14 scraper hauls in 1200 seconds or 20 minutes. Therefore, instead of loading 10 cars in an hour with 20 men, four men now load 20 cars. The costs of handling 108,000 cu. m. of limestone rock per year, including cost of capitalization, equipment, repairs, cables, interest, electricity and salaries, is 26,000 Reich Mark, while before the installation it was 150,000 Reich Mark.—*Tonindustrie-Zeitung* (1931) **55**, 4, pp. 51-53.

Means for Closing the Valve of Valve Bags. The inventor describes a method of closing the valve of valve bags by means of a cloth flap in the interior of the sack to which a draw-string is attached. On pulling the draw-string, which extends outside the bag, the valve is positively closed. Means are provided for sealing the ends of the draw-strings to prevent tampering with the contents of the bag.—*John C. Redington, assignor to St. Regis Paper Co. U. S. Patent No.* 1,762,697.

Recent Developments in Ball Mills. J. Winkel describes the operating principle of ball mills, including a table of data on ball mills now in use. A rule for ball mill operation is that if the sound of the balls is still quite audible, the mill is doing good work.

In recent designs the residue not ground is removed by reversing the usual direction of rotation of the drum so this material can pass out through special openings by way of slits *e* in the grinding plates *a* and special chambers arranged with metal liners *d* between the coarse screen *b* and the fine screen *c* which surround the grinding plates *a*, as shown in Fig. 1. The drive shaft has been replaced by short hollow pivot shafts through which the drums are discharged by

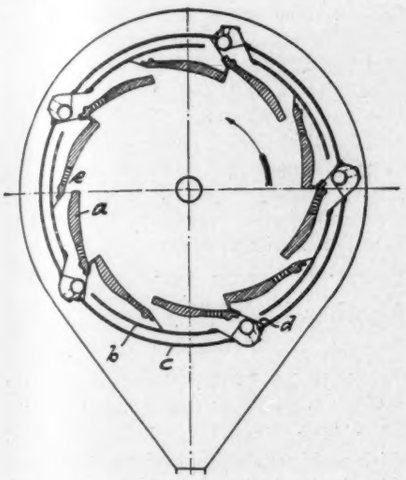


Fig. 1. Method of discharging underground residue from ball mills

use of radial arms passing ground material over a cone to the screen, as shown in Fig. 2 the drum being charged through a special socket.

In order to increase the impact energy of the balls and therefore the output of the

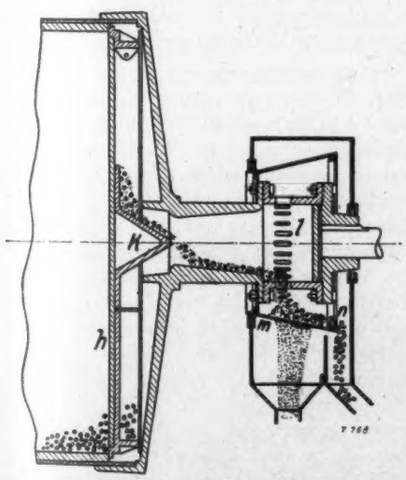


Fig. 2. Discharge of raw material by means of radial arms and cone to screen through hollow pivot shaft

ball mill, so that a grinding drum of smaller diameter can also pulverize hard material, the drums are run at a higher speed; but due to the increased centrifugal force the grinding media and the material being ground adhere to the inner wall of the drum and nullify the grinding action. The impact energy of the balls is composed of the head of drop of the balls, their actual weight and the energy which is given to them by the rotation of the drum. This energy increases with an increase in circumferential speed of the drum. By means of ball deflectors as shown in Fig. 3, it is possible to effect good grinding under the above conditions. A sta-

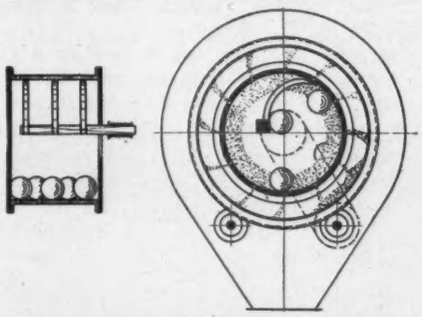


Fig. 3. Method of deflecting balls for effecting better grinding at higher circumferential speeds

tionary rake is provided in the upper half of the grinding drum, the prongs of which are sickle-shaped and the space between them is smaller than the diameter of the balls, so that the material passes through the rake while the balls are held back and are deflected downward to impinge upon the material.—*Tonindustrie-Zeitung* (1931) **55**, 12, pp. 170-171.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Manufacture of Anhydrous Magnesium Chloride. The inventor proposes to mix MgO or $MgCO_3$ (dolomite) with coal dust in molded shapes and then chlorinate at temperatures below the melting point of the magnesium chloride. The carbon dioxide evolved makes the mass porous and is an essential feature of the patent.—*Karl Staib, assignor to I. G. Farbenindustrie Aktiengesellschaft, U. S. Patent No.* 1,749,854.

Waterproofing and High-Early Strength Cement. The inventor describes his method of waterproofing portland cement concrete which at the same time increases its strength and workability. He maintains that cement clinker to which oil has been added prior to grinding improves the waterproofing features of the resulting concrete but often at the expense of some strength. He also calls attention to the limitations in the use of calcium chloride as an accelerator, mainly that $CaCl_2$, to be of any value, must be present in considerable quantity. His invention is based on his claims that if a concentrated solution of calcium chloride is emulsified with crude oil and this emulsion used as an admixture to the dry cement, or when gaging with water, that concrete of greater workability and waterproof results. The emulsion also develops high early strengths, according to the inventor.—*Frederick W. Huber, U. S. Patent No.* 1,772,999.

Improvement in Dust Arresters. An improvement in a well-known dust arrester permits one-half of the screen chambers to take the whole current of air for a short period while the screens in the other half are being rapped. The rapping period is made so short that this may be done, the inventor claims, without loss of efficiency. The means is a crank and levers which close

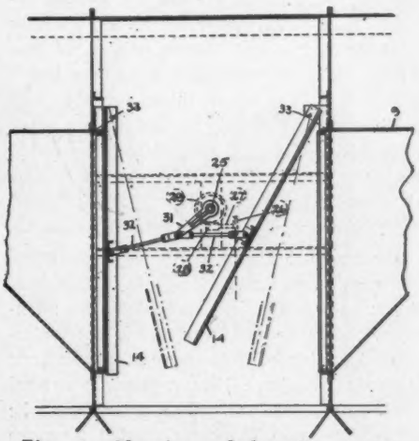


Fig. 1. Showing whole air current thrown on one chamber momentarily

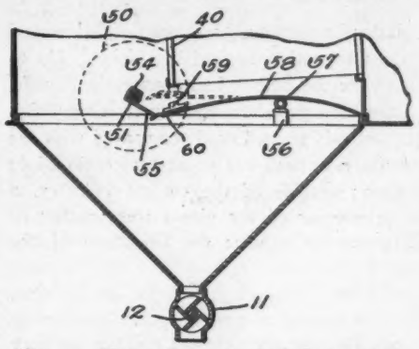


Fig. 2. Manually operated flat spring forms rapping mechanism

off one chamber and open the other. The rapping mechanism is a flat spring vibrated by an arm on a rotating shaft. Both mechanisms for changing the air current and for rapping the screens are manually operated and the inventor says that this is preferable in the majority of installations.—*George A. Boesger, assigned to the Sly Manufacturing Co., U. S. Patent No.* 1,775,304.

Cedar Plaster. The patentee describes a method of preparing a moth- and insect-repelling plaster by mixing gypsum plaster or other less commonly used mineral wall plasters with cedar wood oil. The characteristic odor of oil of cedar wood is thus imparted to the room or building coated with this material. One successfully applied plaster of this nature is described as consisting of Keene's cement, 84%; cedar wood dust, 5½%; oil of cedar wood, 6½%; clay, 3%, and red coloring matter, 1%. Other similar formulas are given as illustrations.—*Edwin D. Coddington; Ernest A. Kerler; Roe R. Black and Harvey S. Owen, assignors to the E. D. Coddington Manufacturing Co. U. S. Patent No.* 1,752,232.

Ed. Shaw's News Letter From Los Angeles

J. R. THOENEN, of the U. S. Bureau of Mines, has been in Los Angeles the past week and I have been going about with him, not only because we are old friends, but because I am much interested in the work he is doing and would like to help it all that I can. Mr. Thoenen is a man who had a vision. It is a good thing for the rock products industry that he had it, but when he explained it to me three years ago—or maybe it was four years—I was very skeptical about his making it a reality. There were others who felt the same way about it.

He was originally a mining engineer of the regular sort and he put in 10 years at the International Nickel Co.'s mines in Ontario. Then he got interested in the underground mining of limestone and worked out methods that have been applied in several important operations. The papers that he wrote for Rock Products at that time are among the classics in the literature of the industry.

Later he went to the Bureau of Mines and it was then that he had his vision. Up to that time the bureau had apparently thought of the rock products industry as a stepchild. Its methods seemed crude compared with the carefully worked out processes employed in mining; outside of the cement industry, a large number of the plants were rather of a temporary nature; the literature of the industry was scanty, and there was no such profession as rock products engineering. The bureau did not seem to find much that it could do for the industry and the industry hardly knew that the bureau existed.

Outlined a Big Job

Apparently the bureau thought it was overlooking something, for at his request it gave Mr. Thoenen a job with considerable latitude. His idea was, first, that he could considerably improve the status of the industry with the bureau; second, that he could make some very valuable additions to the literature of the industry, and, third, that he could make the bureau the same sort of a clearing house for information for the rock products industry that it was for the oil and metal mining industries. The way he proposed to do this was to have complete, accurate and very detailed reports of operations written by the operators themselves. These were to cover everything, including costs, and were to be written to a standard outline so that they could be readily compared.

I liked the idea when he told me about it, but I very much doubted that he would persuade more than a few operators to take on such a hefty job as the preparation of a report of this kind. Also—having had some experience—I thought he would find it quite a task to extract some of the information he said he wanted, especially in localities where competition was keen.

He got a lot of joy out of recalling this to me as we went from one producer to another. For every one of them said at once that he would be pleased to co-operate with the bureau on this work. I had to admit myself a poor prophet. But something has to be credited to Mr. Thoenen's salesmanship and still more, I believe, to a changed viewpoint of the heads of big businesses in this country.

New Thought in Business

It is only a few years ago that the ordinary business man's first thought was, "How can I beat my competitor?" Now his first thought is more often, "How can I build up this business on a safe and secure foundation?" And by the word business he means not only his individual enterprise but the industry as a whole. I got this idea plainly as I listened while Mr. Thoenen was talking with Paul Graham, of Graham Bros., Long Beach. This concern spends liberally on research and investigation and has found it profitable to do so. Naturally it would be willing to co-operate in the collection and exchange of such information, as they had found it to be so valuable. And as for costs, L. L. Rogers, of the Consolidated Rock Products Co., said his company would be quite willing to divulge actual operating costs to anyone who intended to go into the rock and sand business here. Ignorance of the real cost of getting out these materials is what has built many a plant here, that is now standing idle, representing only a waste of the stockholders' money.

Yes, the views of the men who control industry concerning competition and public relations has changed steadily in the past few years and it is still changing. Business ethics move steadily to a higher plane. When I get a bit discouraged thinking of the future, as those of us who are past middle life are apt to get at times, there is always that solid and very comforting fact to fall back upon.

Local Committees Working

We had lunch with the Committee on Nonmetallic Industries of the Los Angeles Chamber of Commerce, and it was an interesting session. This committee is not wholly made up of producers; it includes members of the larger testing laboratories, who more often represent consumers, and railroad men who are interested in the transportation of such products. The committee is divided into sub-committees that are studying specifications for about 20 nonmetallic mineral products. Naturally they are not trying to frame specifications for all of these, but they may be obliged to do so in a few cases where satisfactory specifications do not exist. Bentonite is a mineral for which specifications are needed, I judge from the discussion I heard. But the main purpose of the committee seems to be to study and classify specifications, government, state and individual trade specifications, especially for minerals produced locally and for those that have a large local use. Already those who have heard of the committee are writing to it for information about markets and specifications for local products. Apparently there is going to be plenty for the committee to do and it will be well worth doing.

Another Lady Sand and Gravel Producer

MRS. JOSH BAKER is president of the Baker Sand and Gravel Co. and of the Baker Tow Boat Co., Tuscaloosa, Ala., which positions she has held since the death of her husband, Captain Josh Baker, in 1926. While there is hardly any phase of industry or any profession in which a woman has not proved herself as capable as men occupying similar positions, Mrs. Baker is doubtless the only woman who owns controlling interest and is president of two businesses like these. She has a remarkable grasp of good business procedure and has carried forward the work of these two companies in such a way as to make them valuable contributions to Tuscaloosa's industrial life.

Besides being a successful business woman, Mrs. Baker is a fine Christian citizen. Her interest in the work of her church, the First Methodist, is unfailing. There is no financial responsibility which this church has in which she does not gladly and generously share. For the past two years she has been chairman of the local work committee in the Woman's Missionary Society of this church. During this period she has been responsible for marked improvement in the appearance of the church building and the parsonage, such as painting, building of cabinets, refurnishing, etc. Along with these larger changes, she has shown the ability that only a good housewife has of adding small improvements that bring home-like comfort and beauty.

Her success as a business woman has not robbed her of any of her feminine charm. She is attractive in personality and appearance. She loves her home, which is located in Thomas Circle, one of the most desirable residential sections of the city. She loves her family—the most important member of which is probably Joshua Leigh Harrison, her small grandson, who seems to demand his share of time.—*Tuscaloosa* (Ala.) *News.*

Cement Products

Concrete units used to good advantage on a Maryland dairy farm

Pre-Manufactured Concrete*

By M. D. Catton

Highways and Municipal Bureau, Portland Cement Association, Chicago, Ill.

THE SUBJECT of pre-manufactured concrete covers a field in which three methods of manufacture are recognized: (1) transit-mixed concrete; (2) central mixed concrete transported in trucks, and (3) central mixed concrete transported in agitator type trucks. The last method is a combination of the first two methods. It may be granted that the production of pre-manufactured concrete fills certain definite needs and fields which cannot be filled by other means.

The extent of present development is shown by the fact that an estimated 6,000,000 cu. yd. were produced in 1930. Further evidence of the interest of the development of pre-manufactured concrete is the time devoted to this subject by the American Road Builders' Association, as well as extensive activities of engineering societies and organizations and equipment and manufacturing organizations. I believe the ultimate extent of its development is entirely dependent upon the production of quality concrete. For this reason, we are particularly interested in the quality of concrete at the time it is placed in the work. Any service we can render to insure more uniform, durable and workable concrete produced by any pre-manufactured method will be gladly tendered.

*Presented before the National Association of Paris Transit Mixed Concrete Manufacturers, St. Louis, Mo., January 9, 1931.

Fundamentals of Quality Concrete

In order to discuss the factors which influence the quality, durability and workability of concrete, it is necessary to know what is desired in concrete as a finished, manufactured product. Briefly, the fundamental requirements of hardened concrete are strength, durability and economy. Fresh concrete must be workable, that is, it must be of such a consistency and physical make-up that it can be readily placed in the work without segregation of the materials and without requiring an excessive amount of spading. Uniformity in both the fresh and hardened concrete is necessary to secure economy of materials, to facilitate handling and placing, and to obtain uniformity in the completed structure.

The quality of the concrete specified for each type of concrete work will depend on the degree of exposure in a particular case, and the strength required. There will also be some instances where the concrete specified is further restricted by conditions of consistency required in placing or finishing the concrete. All these factors will be determined beforehand by the specifications governing the work. The item of interest to the producer of pre-manufactured concrete is what these requirements are at the site of the work. His problem is to produce the concrete in such a manner that these requirements are met when he delivers his manufactured product.

His entire manufacturing process must be such as to create the utmost confidence and respect. Methods have now been devised to rapidly determine from a batch of fresh concrete the mixtures of cement, aggregate and water at the time of discharge from the mixer or at any time up to the beginning of the hardening period.

Test for Ingredients of Mixed Concrete

Briefly, this test consists of weighing a sample of concrete in air followed by weighing the same sample in water. The sample is then screened on nested No. 4 and No. 100 sieves and all cement passing the No. 100 sieve washed out. The aggregate retained on the two sieves is again weighed in water. The data thus obtained permit a few calculations to give the amounts of water, cement, fine and coarse aggregate composing the batch of concrete

sampled. This method is simple, rapid, inexpensive and accurate. (A manual covering this test procedure can be secured from W. M. Dunagan, assistant professor civil engineering, Iowa State College, Ames, Iowa, for 35 cents. Equipment can be secured from the Humboldt Manufacturing Co., 2014 Nebraska Avenue, Chicago, Ill.; no doubt other equipment manufacturers would be in a position to supply this test apparatus as well.)

Importance of Water Ratio

Research in making concrete has determined that for given qualities of materials, the strength, durability, permeability and other qualities of concrete are largely or almost entirely dependent upon the quantity of the mixing water used in its making. A definite relation has been established between strength, and the ratio of water to cement. Fully confirmed, this relation is now expressed as a law, and is stated as follows:

"For given materials and conditions of manipulation, the strength of concrete is determined by the ratio of the volume of mixing water to the volume of cement so long as the mixture is plastic and workable."

Note particularly four items in this law. First, "for given materials," second "for given conditions of manipulation," third, "so long as the mixture is plastic" and fourth "so long as the mixture is workable."

Each of these four points iarries special significance to producers of pre-manufactured concrete. The procedure followed in making pre-manufactured concrete is somewhat different than with other methods. The greatest difference is due to the newness of this phase of concrete construction. People are often prejudiced against new things. The water-cement ratio law offers you an opportunity to prove that your methods of producing concrete are adequate. Have recognized laboratories or authorities make tests with your "materials," your "conditions of manipulation" and produce "plastic" and "workable" mixtures. Have the tests made strictly according to standard A. S. T. M. methods. Use these tests to determine the quality of your produce not only from batch to batch but all parts of each batch. Sound technical procedure will gain for your industry confidence and respect among engineers and contractors. They will have a kindly, co-operative attitude toward you because of your appreciation of their problems.

Importance of Good Aggregates

Sound aggregates are necessary to produce durable, impermeable concrete. The cement paste in which they are embedded is made durable and impermeable by low water-cement ratios and thorough curing.

Consider as one extreme the water-cement ratio requirements of mass concrete in dams. In past years it has been common practice for designing engineers to compute certain stresses in the structure which are based on empirical formulas. Field investigations of dams constructed over a period of years do not show failure as a result of structural stresses in excess of those for which the structure was designed. However, these same field investigations disclosed that some concrete dams are beginning to require patching or repairs due to high water-cement ratios which produced concrete of sufficient strength to meet design requirements, but not durable enough to withstand ordinary weathering agencies. Dams are built to give service over an indefinite period of years and because of this fact durability becomes a paramount issue in design. Accordingly, present design requirements for dams and other important exposed structures emphasize durability as well as strength requirements.

As another extreme consider the design of floor slabs in office buildings. Here durability is an item of relatively less importance. The floor will be protected from moisture, freezing and thawing and exposed to a relatively narrow temperature range. On the other hand, the stresses to be carried by the floor slab may be quite high and as a result this case requires primary attention to strength considerations.

A pavement slab presents both phases discussed in the two preceding examples. Exposure is severe because the slab is thin, the bottom continually exposed to moisture and the temperature ranges are wide and severe. In addition, stresses due to truck and bus loadings are high. Both conditions require low water-cement ratios and close control of quality.

The importance of durability is so great that water-cement ratio recommendations have been made by the Portland Cement Association for various types of structures under varying degrees of exposure. These recommendations are given below.

None of these quantities should be exceeded even when resultant strengths are higher than required by structural stability. Free water or moisture carried by the aggregates must be included as part of the mixing water.

How to Use Tables

These general tables place you in a position to recommend certain classes of concrete for certain work which, if properly placed, you can be sure will give satisfaction even when you are not controlled by specifications. Study the problem carefully and each producer his own field. Perhaps some of you will be selling concrete largely under definite specifications set for you. Others may be filling a miscellaneous market. The last man must have someone in his organization who knows the technical end of concrete. If possible hire a competent concrete engineer to supervise your operations. He will pay for himself in the economies he effects for you. If an engineer is out of the question, study the subject yourselves. The Portland Cement Association publishes a booklet "The Design and Control of Concrete Mixtures" which covers the subject thoroughly. We also hold occasional schools on the same subject. Someone in every organization must take this subject of technical concrete as his job and see it through.

Your full appreciation of the necessity of specifying a concrete which will give satisfaction will result in satisfied customers. Your business is a new business. The rapidity with which you grow will depend upon your keeping faith with the contracting public.

Concrete Products' History

As a case in point in the concrete business, I might mention the history of concrete blocks and concrete products. In the early years each producer was a law unto himself in regard to the quality of his product. The product had intrinsic merit and for a few years grew by leaps and bounds. Suddenly, this growth stopped and retrogression began. For a period of time it seemed the products industry was doomed. Slowly it

WATER RATIO RECOMMENDATIONS OF THE P. C. A.

Exposure	Class of Structure — Water-cement ratio, U. S. gal. per sack: Reinforced piles, thin walls, light structural members, exterior columns and beams in buildings	Reinforced reservoirs, water tanks, pressure pipes, sewers, canal linings, dams of thin sections	Heavy walls, piers, foundations, dams of heavy section
Extreme:			
1. In severe climate slike in northern U. S., exposure to alternate wetting and drying, freezing and thawing, as at the water line in hydraulic structures	5½	5½	6
2. Exposure to sea and strong sulphate waters in both severe and moderate climates			
Severe:			
3. In severe climates like in northern U. S., exposure to rain and snow, and freezing and thawing, but not continuously in contact with water	6	6	6¼
4. In moderate climates like southern U. S., exposure to alternate wetting and drying, as at water line in hydraulic structures			
Moderate:			
5. In climate like southern U. S., exposure to ordinary weather, but not continuously in contact with water	6¼	6	7½
6. Concrete completely submerged, but protected from freezing			
Protected:			
7. Ordinary inclosed structural members; concrete below the ground and not subject to action of corrosive ground water or freezing and thawing	7½	6	8¼

came home to products manufacturers that there was no general effort to control quality. Investigation of the ever-increasing number of failures drove this home. Every job constructed of quality blocks was giving service. As a result, quality of concrete products became an issue among all manufacturers. They instituted a house cleaning among themselves and organized an association on a quality basis. Every products manufacturer must first meet certain quality requirements in the production of his product before he can become a member of the organization. Today, the products industry is again a thriving, growing industry.

I have covered the general subject of quality concrete as it applies to pre-manufactured concrete. There are also other phases of concrete which must receive serious consideration. The more important of these are segregation and proportioning.

Plant Operating Details—Segregation

Perhaps the greatest handicap producers of pre-manufactured concrete have to overcome is adverse criticism regarding the uniformity of succeeding batches. The kinds of segregation in concrete are of three types. Segregation of the aggregates into various sizes, segregation of mortar from the aggregates and segregation of water from the combined mortar and aggregates after mixing.

The cause of segregation of coarse aggregate into its various sizes can generally be traced to one of two factors or a combination of the two. In the first case the coarse aggregate should be well graded from its smallest to its largest size. Likewise, the fine aggregate should be well graded. Further, the maximum size of coarse aggregate together with the percentage of the larger sizes have a major influence on segregation. The generally accepted requirement that aggregates be well graded to give maximum strength is of further interest to you since it will also reduce segregation to a minimum.

As a friend of mine expresses it, you can't keep concrete from segregating that's made of cannon balls and blow sand. You are in a particularly advantageous position to insure well graded materials. A central proportioning plant is a necessity. It is also essential that you use weight proportioning methods. It is no more expensive than the old method of volume proportioning and it is many times more accurate.

Must Make Variety of Products

Further, in the production of pre-manufactured concrete you must be in a position to supply concrete for all classes of work from mass concrete to thin floor slabs. This requires a wide variation in the maximum size material you may use. It is therefore, an economic necessity to provide bins at your central proportioning plant for at least three sizes of coarse aggregate and two gradings of fine aggregate. The coarse aggregate to be divided by sizes into ¼ to ¾ in., ¾ to 1½ in., 1½ in. to 2 or 2½ in. and in special cases a separate bin for material over 2½ in. The two gradations of sand should consist of a sand for paving and general mixes graded from ¼ in. and a fine sand graded from a No. 20 mesh sieve.

Control of Fine Aggregate

The dividing of the sand is obviously not as necessary as the coarse aggregates. However, many segregation troubles are traceable to the amount of material passing the 20-mesh sieve. The availability of a sand graded from a No. 20 mesh sieve will permit control over this troublesome point. Many mixes which seem to need an admixture for workability can be adequately controlled by using more fine sand, which is certainly a very economical admixture. The binning of the aggregates as just indicated will give you a complete control over your proportions. It is the first step in producing quality concrete. Incidentally, it will be your means of producing economical concrete.

Proportioning

The segregation of water from the mix is due primarily to using too much mixing water. It is also due to permitting mixed batches of concrete to stand before they are placed. Proportioning on the basis of water-cement ratio and handling the concrete properly will reduce this type of segregation to a minimum.

The subject of proportioning has already been touched upon as it influences segregation of the resulting concrete. Perhaps the greatest point of interest to you in regard to proportioning is the economies which proper proportioning will effect.

In determining the proportions of materials it is desirable to arrive at those proportions which will give the most economical results consistent with proper placing. The relative proportions of fine and coarse aggregates and the total amount of aggregate that can be used with fixed amounts of cement and water will depend not only on the consistency of concrete required but also on the grading of each aggregate. A combination of aggregates made up largely of coarse particles presents less total surface to be coated with cement paste than aggregates of fine particles and is therefore more economical. For this reason it is desirable to use the lowest proportion of fine aggregate which will properly fill the void spaces in the coarse aggregate.

Importance of Grading Aggregates

Aggregates that are graded so that they contain many sizes are more economical than aggregates in which one or two sizes predominate, because the former contain fewer voids. The small particles fill the spaces between the larger particles which otherwise must be filled with cement paste. A properly proportioned combination of well graded fine and coarse aggregates contains all sizes between the smallest and the largest without an excessive amount of any one size. The best grading, however, is not necessarily one consisting of equal amounts of the various sizes and such a grading is seldom practical. Satisfactory mixtures can usually be obtained with the commercial aggregates by proper combination of fine and coarse aggregate.

The Dividing Line

Increasing the proportion of coarse aggregate up to a certain point reduces the cement factor. Beyond this point the saving in concrete is very slight, while the deficiency in mortar increases the labor cost of placing and finishing. Because coarser gradings are more economical, there has been a tendency to use mixtures that were undersanded and harsh. Harshness has been the principal cause for over-wet mixtures, resulting almost invariably in honeycombing in the finished work. While increasing the proportion of fine materials makes for smoother working mixes, excessive proportions of fine present greater surface areas to be coated and more voids to be filled with cement paste. Under such conditions the total amount of aggregate which can be used with fixed amounts of cement and water is reduced.

Consistency and Workability

The total amount of aggregate that can be used with given amounts of cement and water will also depend on the consistency required by the conditions of the job. When a stiffer mix can be used more aggregate can be crowded into the same cement paste and thus give a larger volume of concrete. In this connection, it is of particular importance to you to give consideration to the fact that increased mixing time increases workability. Stiffer mixes cost less for materials than the more fluid mixes, but the cost of handling and placing increases when excessively dry mixes are used. On the other hand, mixes that are over-wet require high cement factors and cannot be placed without segregation of the materials. In many instances, where correct proportions of sand are used, it will be found practical to use somewhat stiffer mixtures than have often been used without adding materially to the cost of handling or placing. It must always be borne in mind, however, that durability requirements must be adequately fulfilled.

From the foregoing discussion it will be seen that a concrete engineer can be a real benefit to each of you in fully developing the possibilities of pre-manufactured concrete. As individuals, it may not be possible or advisable at this time for each of you to employ such a specialist. However, either as regional groups or as a national organization the services of such a specialist might be secured.

New Minnesota Gravel Operation

THE BECKER COUNTY SAND AND GRAVEL CO., Clitherall, Minn., has leased the Carl Hamann farm one mile east of Clitherall and is installing a large modern screening, crushing and washing plant, for the purpose of shipping and furnishing gravel to road pavement contracts. It is understood that this company will furnish gravel for the pavement job on the highway from Fergus Falls to Breckenridge and machinery and material are arriving daily for the installation of the plant. Operations will begin immediately. It is estimated the cost of the plant will amount to $60,000 and it will operate day and night shifts. The plant will be operated by electricity, the current to be furnished by the Ottertail Power Co.

E. A. Mullen, of Detroit Lakes, general manager, is here in charge of operations.

The Northern Pacific Railroad Co. is laying a spur into their plant.—*Fergus Falls* (Mont.) *Journal.*

Gravel Bids on Mississippi State Highway Work

THE FOLLOWING is a tabulation of bids received by the Mississippi State Highway Department for sand and gravel, February 24 (prices are f.o.b. plant):

Bidder, address and pit	Washed gravel: 1½- to ¼-in. No. 1	Washed gravel: 1- to ¼-in. No. 2	Washed gravel: ½- to ⅛-in. No. 3	Sand clay 40%	Sand No. 7
Alexandria Gravel Co., Alexandria—Woodworth	$1.25	$1.25	$1.25	$0.50	$0.60
American Sand and Gravel Co., Hattiesburg, Miss.	.50	.55	.60	.....	.20
Camden Gravel Co., Inc., Camden, Ark.—Van Duzer	.80	.80	.68	.....	.60
Clements Sand and Gravel Co., West Monroe, La.—Minden	1.20	1.25	1.25	.66⅔	.75
Clements Sand and Gravel Co., W. Monroe, La.—Clinkle Spur	1.20	1.25	1.25	.60	.60
Dear and Johnson, Fullerton—Dear	.....	.....	.....	.50	.....
Evangeline Sand Co., Alexandria—Turkey Creek	1.25	1.25	1.25	.50	.60
Forest Gravel Co., Alexandria—Vortex Spur	1.25	1.25	.....	.50	.60
Franklinton Clay Gravel Co., Franklinton, La.	.....	.....	.....	.50	.....
Glenn Hill Gravel Co., Grayson—Rhinehart	.....	.....	.....	.70	.....
Glenn Hill Gravel Co., Grayson—Standard	.....	.....	.....	.97	.....
Herndon, A. H., Alexandria—Stock pile, Pineville	1.55	.....	.....	.....	.....
Herndon, A. H., Alexandria—Stock pile, Tioga	1.55	.....	.....	.....	.....
Herndon, A. H., Alexandria—Stock pile, Pineville	.....	.....	.....	1.25	.....
Herndon, A. H., Alexandria—Stock pile, Tioga	.....	.....	.....	1.25	.....
Holloway Gravel Co., Amite—McManus	.95	.95	1.00	.....	.55
Holloway Gravel Co., Amite—Roseland	.85	.85	.90	.....	.45
Jahncke Service, Inc., Brookhaven, Miss.	.....	.....	.....	.30	.....
Lutesville Sand and Gravel Co., Baton Rouge—McNeely	1.10	1.10	1.10	.60	.50
Material Service and Development Co., N. O.—Roseland	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Amite	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Bogalusa	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Jenkins	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Pinecliff	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Price	.85	.85	.90	.....	.45
Material Service and Development Co., N. O.—Denham Spur	.95	.95	1.00	.....	.55
Material Service and Development Co., N. O.—Fluker	.85	.85	.90	.....	.45
Merriwether Sand and Gravel Co., Shreveport, Lewisville, Ark.	.90	.78	.78	.60	.60
Merriwether Sand and Gravel Co., Shreveport—Shreveport	.....	.....	.....	.....	.60
Monroe Sand and Gravel Co., Monroe—Stevens	1.20	1.25	1.25	.60	.60
Norfleet Gravel Co., Lecompte—Holdup	.....	.....	.....	.50	.....
Parker Gravel Co., Shreveport—Watts	1.20	1.25	1.25	.60	.60
Parker Gravel Co., Shreveport—Freda	1.20	1.25	1.25	.60	.60
Parker Gravel Co., Shreveport—Ogden	1.20	.....	.....	.....	.60
Producers Gravel and Sand Co., Shreveport—Wilton, Ark.	.90	.90	.90	.....	.....
Rapides Gravel Co., Alexandria—Valderouge	1.25	1.25	1.25	.....	.60
Reader Gravel Co., Shreveport—Reader, Ark.	.67	.....	.....	.....	.40
Sibley Gravel Co., Haynesville—Brunson Spur	1.20	1.20	1.10	.....	.60
Stinson, A. B., Hammond, La.—Franklinton	.....	.....	.....	.45	.....
Tennessee-Arkansas Gravel Co., Arkansas City, Ark.	1.00	1.00	.90	.....	.60
Womack and Chutz, Franklinton—Pico	.....	.....	.....	.50	.....

CLAM SHELLS		
Consolidated Shell Co., New Orleans	$1.80	per ton
Des Allemands Shell Co., New Orleans	1.45	per ton
Jahncke Service, Inc., New Orleans	*1.45	per ton
REEF SHELLS		
Consolidated Shell Co., New Orleans—Stradee	$1.85	per ton
Consolidated Shell Co., New Orleans—New Orleans	1.44	per ton
Gulf Crushing Co., New Orleans—Morgan City	1.55	per ton
Jahncke Service, Inc., New Orleans	*1.45	per ton
Oyster Shell Products Corp., Berwick, La.	1.55	per ton
Camden Gravel Co., Inc., Camden, Ark.—Crushed gravel, 1¼- to ¼-in., 1- to ¼-in.	1.15	per ton

*I. C. Rails.

Illinois Gravel Concern Making Extensive Improvements

AN IMPROVEMENT costing thousands of dollars is in progress at the gravel pit of the Western Sand and Gravel Co. east of LaSalle, Ill., at the present time.

A new plant for the handling of gravel—crushing, separating and loading—is being constructed, the old plant which has been in use for years having been wrecked to make room for the new equipment. Work on the new plant is going forward with all possible dispatch in order that the equipment will be ready for operation by April 15 or 20, the "open" season for placing road gravel on the market.

The actual construction work is under the direction of Andrew Barrowman, Spring Valley building contractor. A force of from 25 to 30 men are engaged daily in the work.

The efficiency of the new plant will be about 100% greater than that of the old equipment. Where 100 tons of gravel were turned out per hour previously, the output when the plant gets under operation will be 200 tons per hour.

The new structure is being erected about 500 ft. east of the old structure in order that the plant may be as close as possible to the gravel supply. When the original plant was built the supply of gravel was close by but since then the cavity has grown extensively and the gravel banks have receded quite far from the old plant and the C. B. & Q. railway sidings. New sidings will have to be built, also.

New crushing and screening devices are to be built into the new plant. Two new double-deck vibrating screens and five belt conveyors which will carry the gravel from the field hoppers to the crusher and loading platform are of the most modern type. With the new plant in operation the local company will have a wider range of gravel sizes to place on the market.

Barring unforeseen delays, the plant will be ready for operation at full capacity late next month. Yearly the plant operates from March until late fall. Through the rush period in the summer operation is for 24 hours daily with two shifts of about 10 or 12 men.—*LaSalle-Peru* (Ill.) *Post-Tribune.*

New Gravel Operation for Healdsburg, Calif.

OVERRIDING the objections of Delano Grant, representing the Russian River Gravel Co., and Larry Comerford, representing property interests on both sides of the river above the gravel bar sought to be used, the board of supervisors of Healdsburg, Calif., unanimously voted to give the Basalt Rock Co., Inc., a Napa concern, a franchise for 50 years to construct an overhead tramway across Bailhache Avenue, east of Healdsburg.

The Basalt Rock Co. has secured property rights on both sides of the road for erection of this overhead tramway, and anticipates spending approximately $150,000 in constructing a rock crusher and gravel plant on the rear five acres of the Fiege property, east of Bailhache Avenue, near the railroad right of way. The tramway would be used to convey the gravel from the river to this crushing plant. A right of way, 20 ft. in width, has been obtained over land between the Fiege property and the railway, over which the company would operate to reach a spur track on the railroad property.

This tram line is to be supported by steel columns, with a clearance of 35 ft. The construction is tn be substantial, and the county reserves the right to demand cessation of operation of the line if it should be in such state of disrepair as to be a danger to those using the highway. A liability policy in the sum of $25,000 is to be kept in effect by the Basalt company to protect the county in case of damage suits resulting by reason of operation of the tram line over the highway.

By terms of the franchise, construction and operation of the line is to be completed within one year from May 1 of this year. A. G. Streblow, president of the concern, who appeared in behalf of his company before the supervisors, stated it is the intention of the company to begin construction of the plant in the immediate future.—*Healdsburg* (Calif.) *Enterprise.*

Some Recent Prices Bid and Contracts Let

Chicago, Ill.—Low bids for 750,000 bbl. of cement for Cook county were $1.75 per bbl., less 40 c. per bbl. for returned bags, delivered in the Chicago shipping district.

* * * * *

Amsterdam, N. Y.—A contract for the delivery of 10,000 tons of crushed stone to the city of Amsterdam during the rest of the year was let to the Amsterdam Crushed Stone Co., which submitted a figure of $1.20 a cu. yd.—*Gloversville* (N. Y.) *Herald.*

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Evansville, Ind.—Cement prices broke to new low levels recently when the Lensing Bros. Co. announced it was selling the product at from 25 to 33⅓% lower than it had at any time during the past year. The immediate cause of the slice was the purchase of cement by the Indiana Highway Commission at greatly reduced prices.—*Evansville* (Ind.) *Press.*

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Madison, Wis.—It is believed that the cement requirements of the state for 1931 will be approximately 1,500,000 bbl. When the state bids were opened in February the 13 bids were identical at about $1.24 per bbl. Governor La Follette refused to sanction the price and new bids were ordered. In the bids opened several days ago the average bid was 90 c. per bbl.—*Madison* (Wis.) *Capital Times.*

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Battle Creek, Mich.—A drastic reduction on the price of cement has entered into the city commission's discussion of which one of the five bidders should have the 1931 contract of the city of Battle Creek. City Clerk Thorne stated recently that latest quotations on cement reaching him were $2.02, compared with $2.28, the lowest bid received by the city three weeks ago.—*Battle Creek* (Mich.) *Enquirer-News.*

* * * * *

Muncie, Ind.—The gravel contract for District 1 was let to Harry Hoffman at 60 c. a cu. yd. The gravel is to be taken from the Hannan farm northwest of Gaston. Contract for District 2 was let to the S. and L. Gravel Co. of Marion at 57 c. a cu. yd. The gravel for the district will be taken from the Dan Store farm northeast of Eaton.—*Muncie* (Ind.) *Press.*

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Milwaukee, Wis.—A trade war is apparent in the cement industry, with prices dropping around 34 c. a bbl.

Recently the manufacturers' price of cement to dealers in this territory was based on $1.44 Buffington, Ind., where some of the largest mills operate, per barrel net at the mills. That made the price to the dealer here $2.24, which includes 40 c. for freight and 40 c. for cloth sacks.

"During the last 30 days Wisconsin, Illinois and Indiana, among others, took bids on yearly requirements," A. F. Kroeger, sales manager of the Building Materials Co-operative, stated. "Due to overproduction, some of the mills in the industry cut the established price from 10 c. to 15 c.

"The result was that, because of the range of prices, these states decided to readvertise in the hope of getting lower bids. At the next letting the majority of the mills quoted on a basis of $1.28 net Buffington, or a reduction of 16 c. These bids were again rejected and last week practically uniform bids of $1.10 Buffington, or an additional cut of 18 c., were received.

"In Milwaukee there has been a reduction from $2.24 gross to $1.90 f.o.b. cars to dealers. That is a net cut of 34 c. since the price war started among manufacturers. All manufacturers shipping into this territory are meeting the $1.10 Buffington base, which figures $1.90 gross Milwaukee. Retail prices figures $1.90 gross Milwaukee.—*Milwaukee* (Wis.) *Journal.*

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Davenport, Ia.—The street committee awarded the sand contract to the Builders Lime and Cement Co. on a low bid of 98 c. a ton. The cement contract went to the Builders Lime and Cement Co. on a low bid of $1.87 per bbl. The contract for furnishing stone and gravel of different sizes delivered to the street jobs went to the W. G. Block Co. on a scale of low bids, depending upon the size of material and distance for hauling.—*Davenport* (Ia.) *Times.*

* * * * *

Columbus, Ohio—City contracts totaling $8042 were awarded by the board of purchase, H. C. Cain, secretary, announced. The Roberts Coal and Supply Co., 1270 Leonard avenue, was awarded the contract for 2000 bbl. of portland cement on a low bid of $4080 ($2.04 per bbl.), while the William Miller Coal and Supply Co., 1736 McKinley avenue, received the contract for 1000 bbl. of Incor quick-hardening cement with a low bid of $3190 ($3.19 per bbl.).—*Columbus* (Ohio) *Dispatch.*

New Lime Plant for Iowa

BARNEY FRANZ and son Roy are going into the business of making lime and crushed rock. They have leased a tract of ground on the Verley farm near Fifteen Mile Grove, Iowa, that contains a heavy layer of rock and they will open a lime kiln.

The new firm has bought two rock crushers and a hammermill and they are getting the ground ready to begin operations as soon as the new machinery arrives. The lime will be used for fertilizer, for which there has been a growing demand in the county from year to year. The crushed rock if it is the quality suited to the needs of the roads will be used for road construction. The lime product that will be made will be delivered by truck to the consumers and some of it will be available for use this spring.—*Grundy Center* (Ia.) *Register.*

Trade Practice Rules Revised; Group II Rules Retained

THE FEDERAL TRADE COMMISSION announces its completion of the task of reviewing the rules of business practice adopted by close to 80 industries at trade practice conferences held at various times, mostly in the last five years.

The rules for each industry will be announced separately in the near future after each industry has been given an opportunity to adopt changes made by the commission.

While details will not be made known until the statements concerning each industry are released for publication, it may be said that the Group II, rules which relate to expressions of the trade, as being generally retained in the language of the industries, although there are some changes suggested by the commission. Group II rules relate to practices and methods in doing business that the industry believes are opposed to economic principles or to fairness, or ethics, or good morals, although such practices or methods are not required by law. Rules concerning practices regarded as unfair methods contrary to law are placed in Group I.

Fires "World's Largest Blast"

THE LARGEST well-drill blast ever made in history was "shot" March 23 at the quarry site of the Inland Lime and Stone Co., near Manistique, Mich. This company is a subsidiary of the Inland Steel Co. Some $40,000 worth of explosives were used in opening up a new high calcium limestone quarry nearly a mile long and 150 ft. wide. Three hundred and twelve thousand lb. of explosives were used, which is 100,000 lb. more than ever used in a similar blast. It is estimated that the blast displaced at least one million and a half tons of rock. A single cap set off the charge and 280 lb. of dynamite in each of the 2480 holes, drilled to a depth of 33 ft. in the solid rock, exploded simultaneously so far as the ear could tell. There was but a slight tremor of the earth and not even a glass was broken in nearby buildings. Seventy-five thousand feet of Cordeau-Bickford fuse filled with T N T was used in making the hook-up and it required seven days for 50 men to make the load. The blast was supervised by technical engineers of E. I. du Pont de Nemours and Co., and the Hercules Powder Co., the former being T. H. Michell, of Duluth, and A. A. Bell, of Ironwood; and the latter, C. D. Peacock, of Duluth, and William Keese, of Eveleth, Minn. Among officials present were Clarence B. Randall, vice-president of the Inland Steel Co., Superintendent Cayia and Assistant Superintendent Hitman of the Inland Lime and Stone Co.; F. A. Olson, safety engineer; F. H. Raisky, assistant manager of the du Pont company, Duluth, and Walter Penglase of the du Pont company, Duluth.—*Ishpeming* (Mich.) *Ore.*

Photoelectric Cell Finds an Application in Ready-Mix Concrete Plant

By E. J. Patton*

THE Stephens-Adamson Manufacturing Co. has introduced a novel feature in automatic control in its ready-mixed concrete plant design. In this application these little electric bulbs work in connection with the scales that weigh the aggregates, cement and water. Each ingredient is brought from storage bins by conveyor and photoelectric cells start and stop the conveyors when exactly the right amount of each material has been added.

The photoelectric cell has been nicknamed "the electric eye," and there is actually a startling resemblance in the operation. Both depend upon varying intensity and quality of light. The photo cell sends out its response in the form of an electric current, while the human eye sends its reaction by a nerve to the human control panel—the brain.

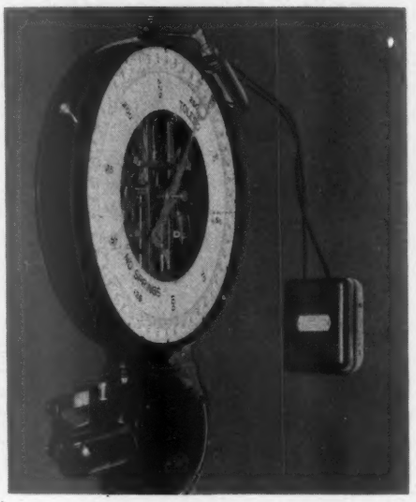
In operation, a beam of light is directed into the photoelectric cell. If the light is constant, the current passing through the cell is constant. When the beam of light is interrupted or varied, the current flowing through the cell is varied in proportion. Sensitive relays amplify the current to the point where even large motors can be stopped or started by means of variation or interruption in light that might be imperceptible to the "human eye."

The photoelectric cell not only responds to the slightest variation in color values and light intensity, but its acts with the well known speed of electricity. The action is not subject to fatigue as is a human workman, whose speed and accuracy drops as he tires. In fact, the endurance and speed of the photo cell is only limited by the mechanical cycle of the machine being operated.

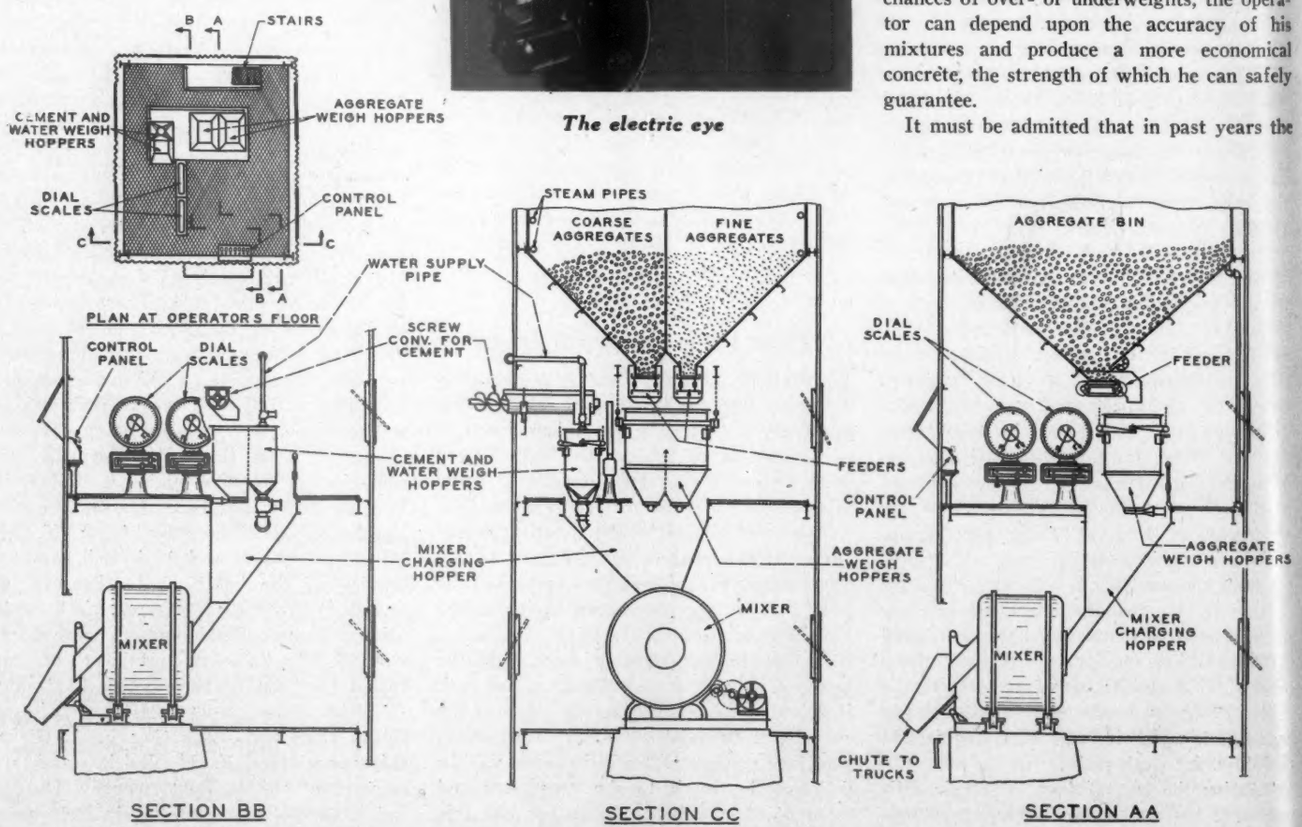
The use of the photoelectric cell in the ready-mixed concrete plant is not so much one of speed as it is of unfailing watchfulness and precision. In the new Stephens-Adamson control system, photo cells have been built into Toledo dial scales in such a way that the scale pointer swings between each cell and its exciting lamp. As the pointer cuts the light entering a cell, a relay instantly stops the flow from the conveyor that has been filling the weigh hopper with aggregate, cement or water. Each photoelectric cell and its exciting lamp can be set to act at any weight.

It is to be hoped that the introduction of the "electric eye" control into the proportioning and mixing plant will mark a new step toward the standardization of concrete mixtures and strengths. In eliminating the chances of over- or underweights, the operator can depend upon the accuracy of his mixtures and produce a more economical concrete, the strength of which he can safely guarantee.

It must be admitted that in past years the

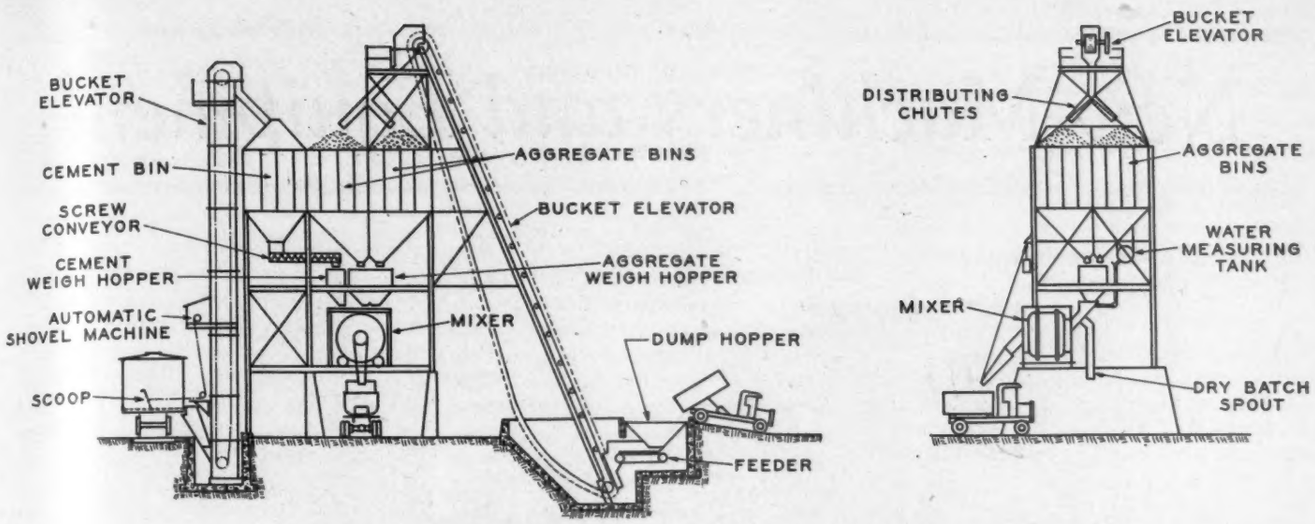


The electric eye



Plan of mixing unit at operating floor, and section drawings

*Stephens-Adamson Manufacturing Co., Aurora, Ill.



Design for ready-mix plant handling aggregates by bucket elevator

strength of concrete has been such a variable item that engineers and architects have had to allow a pretty generous factor of safety. This has often brought the structural cost up to a point where some other method is more economical.

Accurate Control Demanded

The scientifically controlled production of concrete in central mixing plants should give the industry a new impetus. The central plants can afford to use accurate proportioning methods that the individual contractor has seldom been able to approach. This will result in stronger, more uniform and more economical concrete, strengths can be standardized and guaranteed, less bulky structures will be practicable and many engineers predict even greater confidence and popularity for structures built of concrete.

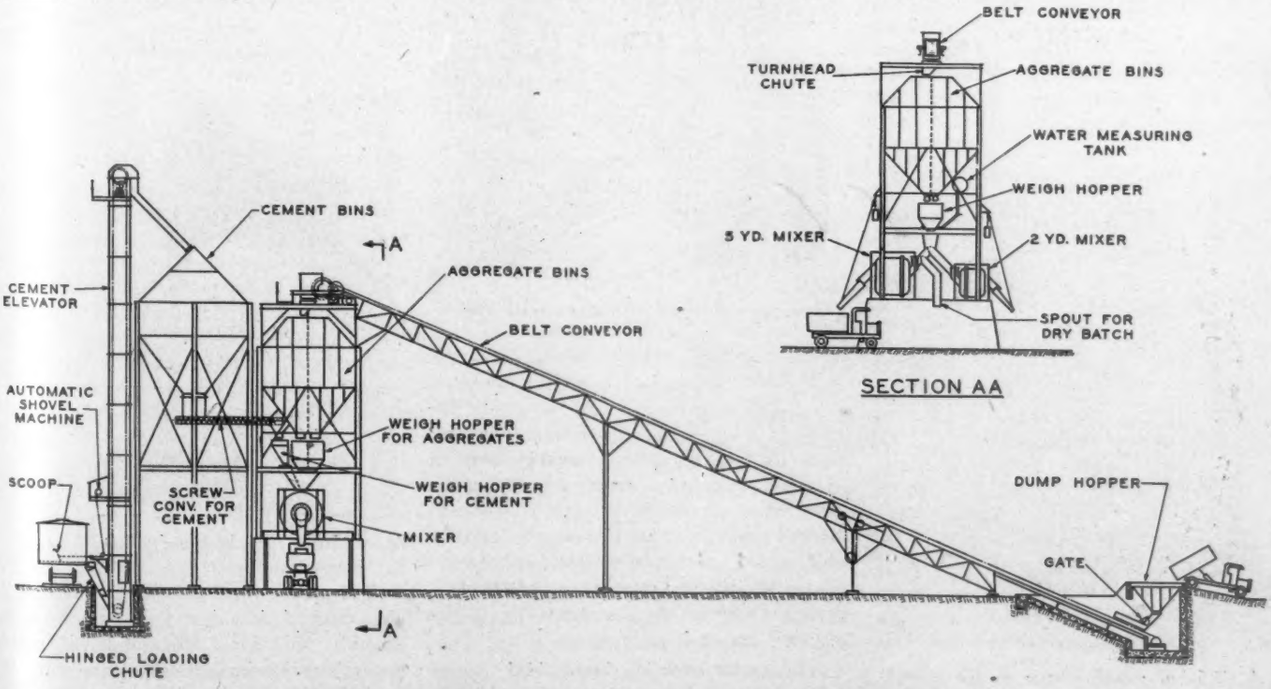
New Motion Picture of Portland Cement Manufacture

THE MAKING of portland cement is visualized in a new one-reel educational motion picture entitled "From Mountain to Cement Sack," prepared by the United States Bureau of Mines, Department of Commerce, in co-operation with an industrial concern. The use of animated drawings and ingenious photographic methods make it possible to show clearly the highly complicated processes employed in the manufacture of this widely used construction material.

Copies of this one-reel educational motion picture film may be obtained for exhibition purposes by schools, clubs, churches, civic and business organizations, miners' local unions, and others interested, by applying to the Pittsburgh experiment station of the United States Bureau of Mines, Pittsburgh, Penn. No charge is made for the use of the film, but the exhibitor is asked to pay transportation charges.

Ironton Gravel Co., Ohio, to Continue Operations

ROBERT R. NEVIN, United States district judge at Cincinnati, Ohio, has entered an order authorizing O. E. Irish, as trustee in bankruptcy of the Ironton Gravel Co., bankrupt, Ironton, Ohio, to continue the conduct of the business of the company as a going concern until August 1, 1931. The trustee was authorized to employ George P. Mahl to manage the business, the salary of the manager to be fixed by court.—*Ironton* (Ohio) *Tribune.*

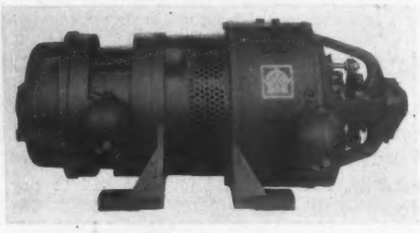


Design for ready-mix plant handling aggregates by belt conveyor

New Machinery and Equipment

Small One-Unit Motor-Generator Set

A ONE-UNIT COMBINATION of the usual alternating current motor and direct current generator has been developed by Reliance Electric and Engineering Co., Cleveland, Ohio, for ratings of one to five kilowatts. This combination requires only

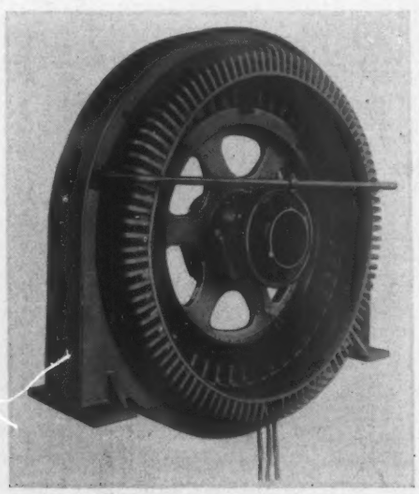


Combination motor and generator

two bearings, one at either end, the same shaft carrying the induction motor rotor and the direct current armature. The manufacturer claims this design provides rugged compact construction requiring small space, and it simplifies aligning and connecting of units. This new set can be furnished for either two- or three-phase circuits of any standard voltage or frequency and has an output rating 1 to 5 kw. at 125 or 250 volts.

Uniform Fabricated Steel Construction

THE Electric Machinery Manufacturing Co., Minneapolis, Minn., announces that an arc-welded fabricated steel stator frame



A 125-hp. synchronous motor with arc-welded stator frame

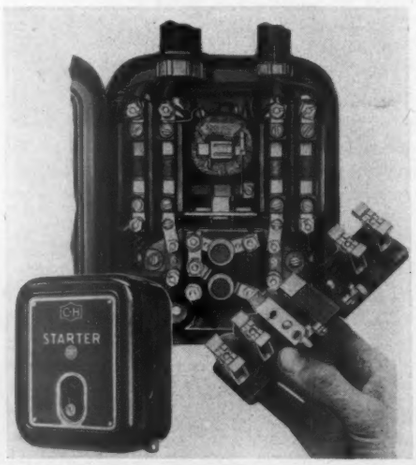
construction will now be used for all medium and slow speed E-M synchronous motors.

A recent change from a two-piece cast-iron stator to a welded-steel stator for small size motors completes the changeover to fabricated steel stator frames. This change makes uniform in appearance and general construction the entire line of E-M engine type and coupled pedestal type synchronous motors.

The box type stator construction is used for the entire line of E-M slow speed synchronous motors. This type of stator construction is claimed to give the following advantages: increased strength and rigidity, decreased weight, increased ventilation, more pleasing appearance and uniformity of construction.

New Magnetic Contactor

CUTLER-HAMMER, INC., Milwaukee, Wis., has redesigned its entire line of type AAA automatic starters for small alternating current motors, to incorporate a



"Twin Break" starting contactor

newly developed "Twin Break" magnetic contactor. This new contactor provides many features which are of interest. The contacts are of heavy coin-silver, which retains its current-carrying capacity even if oxidized, and always makes a good contact with little temperature rise. The "Twin Break" principle reduces the arc voltage by half, and Thermoplax arc pockets, by reducing the air content around the contacts, actually prevent the formation of a destructive arc, it is claimed.

A magnetic latch has been added to prevent accidental closure of the contacts if the starter is accidentally bumped or tilted—the latch must be drawn aside by the operating magnet before the contacts can close. This is an important feature, especially if the starter is mounted on moving machinery, it is said. A new hinge structure facilitates removing and replacing the contact board and insures correct replacing of the board before the starter can operate.

These new contactors are made in three- and four-pole types. The maximum ratings for two- or three-phase are: 3-hp., 110 volts; 5-hp., 220 volts, and 7½-hp., 440 or 550 volts. The illustration is of the Bul. 9586 across-the-line type starter, which is using this new contactor. The contact board is removed to show the silver, butt type contacts.

Handy Floodlight

A 100-WATT general-utility floodlight projector, the "Novalux handy floodlight," has been announced by the General Electric Co., Schenectady, N. Y. Much smaller and less expensive than the usual projectors, the new unit is expected to find new fields where light requirements do not necessitate the larger, standard floodlighting units.

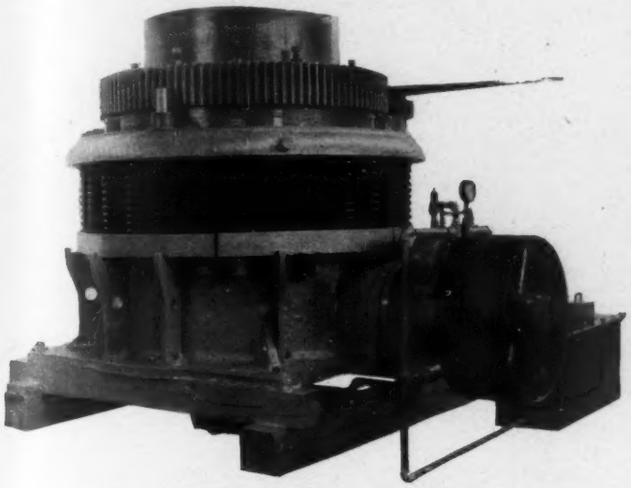
The projector, weighing less than 3 lb.

Light-weight handy floodlight

and measuring less than 9 in. wide, 10 in. deep and 13 in. high with its supporting stand, is built for a 100-watt inside-frosted general-service incandescent lamp with 4⅜ in. light center and medium screw base.

New Cone Crusher

AUGMENTING ITS LINE OF new "Telsmith" primary and reduction crushers, the Smith Engineering Works, Milwaukee, Wis., announces a new Telsmith cone crusher which is guaranteed in the three vital parts against nearly all forms of breakage, including that caused by tramp iron. Exception is made, however, for damage occasioned by dynamite.



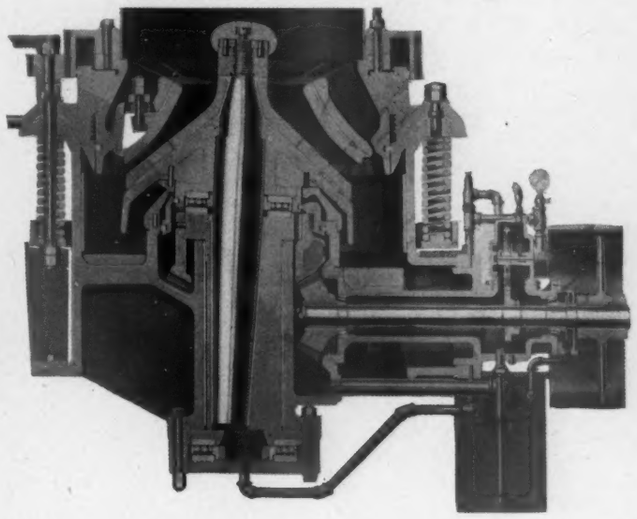


Fig. 1. New cone crusher showing oil tank
Fig. 2 (right) shows eccentric and "knob" design

As shown in Fig. 2, there is a neutral point of gyration, the "projecting knob" above this point designed to agitate the feed and prevent bridging. The long stroke below is designed to give large capacity. Among the special features claimed for this crusher are comparatively high operating speed, and a segmental wedge ring, sealed against grit and water, allowing a wide range of discharge openings, adjustable during operation, and rigidly locked during crushing, and manganese-steel crushing members.

The upper main frame is supported upon the lower section by means of curved flanges, to allow the tilting of the upper frame. Heavy springs are arranged to hold the upper frame in a normally fixed position snug against the lower frame, but when choked by overfeeding or tramp iron, yielding to allow the uppper frame to rise momentarily at the point of stress. This spring release, it is claimed, permits of finer adjustment than permissible in other types of eccentrically operated crushers. Other features claimed for this cone crusher are placing of anti-friction bearings where desirable; head and eccentric carried on cylindrical type roller bearings, and the shaft and drive pinion on tapered roller bearings.

The lubricating system has a self-priming, internal gear oil pump supplying force-feed oil to all points. As is shown in Fig. 1, there is a large oil tank with cooling capacity, which also acts as a draining oil sump.

The manufacturer announces the following sizes and capacities: The No. 24, feed opening 3 in., requiring 25-30-hp., weighing 9100 lb., when set for ⅜-in. discharge, 15-20 tons capacity per hr.; set for ¾-in., 30-40 tons per hr.; No. 36, feed opening 4½-in., 50-60-hp., 24,000 lb., and set for ⅝-in. discharge, 45-55 tons capacity per hr.; set for 1-in. discharge, 70-90 tons per hr.; No. 48, feed opening 7 in., 75-100-hp., weighs 35,000 lb., and set for ¾-in., 85-105 tons capacity per hr., set for 1½-in. 170-210 tons per hr.

Oil-Electric Locomotive

A NEW 60-ton, 360-hp. oil electric locomotive for switching and hauling in quarries, around gravel pits, around cement plants and industrial operations has been developed by the Heisler Locomotive Works, Erie, Penn.

The following is given as the performance of this locomotive in a series of tests made with the New York Central's dynamometer car: Showed hauling capacity on level track equal to a 100-ton steam locomotive as indicated by the draw-bar pull of 47,800 lb. And when hauling on grades, it is claimed that the new oil-electric locomotive showed equally good results. In a direct competitive test on a 3% grade with 14-deg. curve, the 60-ton oil-electric pulled 83œ more tonnage than an 80-ton superheated steam locomotive. Ton per ton of locomotive weight, the new locomotive hauled 148% more.

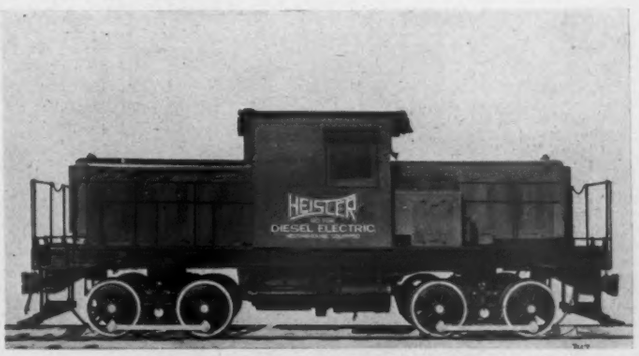
It is claimed that the new locomotive burns only $2.50 to $3.50 worth of fuel oil in a day to do the same work for which a steam switching locomotive burns $20 to $30 worth of coal.

The new locomotive, state the manufacturers, is designed especially for high power at switching speeds. The construction employed permits the electrical equipment to develop greatly increased tractive effort at its hourly and continuous ratings.

Two 180-hp. Buda Diesel engines deliver power to two Westinghouse d.-c. generators, which in turn supply current to two traction motors mounted underneath a Commonwealth integral cast-steel frame. The traction motors are spur-geared to a center drive shaft, which transmits the power through a pair of bevel gears to one axle of each truck. By means of side rods the power is delivered to the other driving wheels. The driving gears have Timken roller bearings.

Universal joints in the drive shaft permit the trucks to swivel freely and make it possible for the locomotive to work on extremely sharp curves.

To insure ample air for switching service the locomotive is equipped with two Gardner-Denver duplex compressors, one compressor driven from each engine.



Sixty-ton oil electric locomotive

Current for starting, lighting, excitation and remote control equipment is supplied by an Exide type M.V.A. storage battery, which is charged by either of the two generators during operation.

The Rock Products Market

Washed Sand and Gravel

Lowest net prices per ton, F.O.B. producing plant or nearest shipping point

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel: ½ in. and less	Gravel: 1 in. and less	Gravel: 1½ in. and less	Gravel: 2 in. and less
EASTERN:						
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.15	1.15	1.75	.....	1.75	1.75
Erie, Penn.	.80	1.00	.....	.....	.....	.....
Leeds Jct., Me., Scarboro, Me., and Milton, N. H. (b)	.....	.50	.....	1.75d	1.25	1.00c
Machias Junction, N. Y.	.65	.65	.65	.....	.65	.65
Montoursville, Penn.	1.00	.70	.60	.40	.40	.40
Northern New Jersey	.20	.20	.40	1.00	1.00	.....
Georgetown, D. C.	.55	.55	1.00	1.00	1.00	1.00
Washington, D. C.	.85	.85	1.30	1.30	1.30	1.30
CENTRAL:						
Attica, Ind.		All sizes, .75–.85 per ton				
Barton, Wis.	.....	.35	.55	.60	.60	.60
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Columbus, Ohio	.65	.30	.50	.50	.50	.....
Crystal Lake, Ill.	.40	.20	.25	.35	.35	.40
Des Moines, Iowa	.40	.40	1.50	1.50	1.50	1.50
Eau Claire, Wis.	.50	.50	.65	1.00	1.00	.....
Elkhart Lake and Glenbeulah, Wis.	.50	.30	.50	.50	.40	.50
Ft. Jefferson, Ohio	.65	.55	.65	.65	.65	.65
Hamilton, Ohio	.65	.65	.65	.65	.65	.65
Grand Rapids, Mich.	.....	.50	.70	.70	.70	.70
Hersey, Mich.	.....	.50	.....	.70	.70	.70
Kalamazoo, Mich.	.....	.45	.50	.60	.75	.....
Kansas City, Mo.	.....	.70	.....	1.50	.....	.....
Mankato, Minn.	.....	.45	.....	1.25	1.25	1.25
Mason City, Iowa	.....	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.	.....	.86	.86	.96	.96	.96
Minneapolis, Minn.	.25	.25	1.25	1.25	1.25	1.25
Oxford, Mich.	.25	.20	.30	.55	.55	.60
St. Louis, Yeatman and Jedburg, Mo., also East St. Louis, Ill.	.20	.45	.50	.20	.20	.50
St. Paul, Minn.	.25	.25	1.15	1.15	1.15	1.15
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Urbana, Ohio	.65	.55	.65	.65	.65	.....
Waukesha, Wis.	.....	.45	.60	.60	.60	.60
Winona, Minn.	.40	.40	.50	1.00	1.00	1.00
SOUTHERN:						
Brewster, Fla.	.40	.....	.....	.....	.....	.....
Charleston, W. Va.	.70	1.25	1.25	.....	.....	.....
Eustis, Fla.	.....	.70	.....	.....	.....	.....
Fort Worth, Tex.	1.00	1.00	1.25	1.25	1.25	1.25
Knoxville, Tenn.	.75	.80	.....	.....	1.20	1.20
Roseland, La.	.50	.50	1.10	.85	.85	.....
WESTERN:						
Phoenix, Ariz.	1.25*	1.15*	1.50*	1.15*	1.00*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
San Gabriel, San Fernando Valleys, Calif. (a)	.80	.80	1.30	1.30	1.30	1.30
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (a) Discount, 20c per ton if paid by 10th of month following delivery. (b) In carload lots. (c) Gravel, 2½-in. down to ¼-in. (d) ⅝-in. down to ¼-in.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding: Fine	Molding: Coarse	Molding: Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.00	.....	.....	.....	.....
Cheshire, Mass.	.....	.....	.....	.....	.....	5.00	.....
Columbus, Ohio	1.50	1.50	.....	.....	.....	3.50	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00	.....
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh, $10.00						
Mendota, Va.	Flint, 8.00 per ton						
Montoursville, Penn.	.....	.....	.....	1.35	.....	.....	.....
New Lexington, Ohio	2.00	1.75	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75	1.75	.....	1.75	1.75	1.75	.....
Ottawa, Ill.	.....	.....	.....	.....	.....	3.50b	.....
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50†	5.00†	3.50†	.....
South Vineland, N. J.	Washed silica, 1.50 per ton; dry white, 2.00 per ton						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00. (b) Per ton in bulk; 7.50 per ton in bags.

Crushed Limestone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

City or shipping point	Screenings, ¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:						
Buffalo, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.25	1.15	1.15	1.00
Frederick, Md.	.50	1.50	1.15	1.15	1.05	1.05
Oriskany Falls, N. Y.	.50	.....	1.00	1.35	.....	.....
Prospect Junction, N. Y.	.80	1.10	1.10	1.10	1.10	1.10
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Hillsville, Penn.	.85	1.35	1.35	1.35	1.35	1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	.....	.....	.....
Afton, Mich.	.25	.25	.25	.....	.65	1.50
Cypress, Ill.	1.20	1.10	1.10	1.00	.90	.90
Dubuque, Iowa	1.05	1.05	1.05	1.05	1.05	1.05
Stolle and Falling Springs, Ill.	1.05	.95	1.15	1.05	1.05	.....
Greencastle, Ind.	1.25	1.00	.90	.90	.90	.90
Lannon, Wis.	.80	.80	.80	.80	.80	.80
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	1.00f
Toledo, Ohio (a)	1.10	1.60	1.60	1.60	1.60	1.60
Toronto, Canada (j)	2.10	2.10	2.10	2.10	2.10	2.10
Waukesha, Wis.	.....	.90	.90	.90	.90	.90
SOUTHERN:						
Cartersville, Ga.	.75	1.15	1.15	1.10	.75	.....
Chico, Tex.	.50	1.30	1.30	1.25	1.20	.....
El Paso, Tex.	.50	1.25	1.25	1.00	1.00	.....
Olive Hill, Ky.	.50	1.00	1.00	.90	.90	.90
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (h)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	.90	1.25	1.10	1.10	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30	1.30	1.10	1.30	1.30	1.30

Crushed Trap Rock

City or shipping point	Screenings, ¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
Birdsboro, Penn.	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Bridgeport, Chico and Knippa, Tex.	2.25	1.80	1.50	1.30	1.20	1.00
Duluth, Minn.	1.00	2.25	1.75	1.65	1.35	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Farmington, Conn.	1.00	1.30	1.30	1.00	.....	.....
Knippa, Texas	2.50	2.50	2.50	1.20	.....	.....
New Britain, Plainville, Rocky Hill, Middlefield, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	.50	1.25	1.45	1.40	1.40	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Toronto, Canada (j)	4.70	5.80	.....	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
Cayce, S. C.—Granite	.....	.....	1.60	1.60	1.40	.....
Currabee, Ga.—Granite	.40	.....	.....	1.00	1.00	1.00
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40l
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.—Granite	.60	1.25	1.25	1.15	1.15	.....
Lohrville, Wis.—Granite	1.80	1.60	.....	1.50	1.50	.....
Middlebrook, Mo.—Granite	3.00	.....	2.00	2.00	.....	1.25
San Gabriel and San Fernando Valleys, Calif. (Granite)	.....	1.30	1.30m	1.30	1.30	1.30

(a) Screenings, including dust. (c) 1-in., 1.40. (d) 2-in., 1.30. (f) Rip rap. (g) Cu. yd. (h) Rip rap, 1.20–1.40 per ton. (j) All prices less 5% for payment 15th following month. (l) Ballast. (m) ⅜-in. and less.

Bank Run Sand and Gravel

Buffalo, N. Y.—Sand, 1/10-in. down, 1.00; ¼-in. down, .85; gravel, all sizes	.75
Burnside, Conn. (sand, ¼-in. and less)	.75*
Crystal Lake, Ill.¶ (½-in. and less)	.30
Fort Worth, Tex.¶ (1½-in. and less, .65; 2-in. and less	.65
Gainesville, Tex.¶ (1½-in. and less)	.55
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hersey, Mich.¶ (½-in. and less, .40; 1-in. and less)	.50
Mankato, Minn.†	.70
Winona, Minn.—Sand, any size	.50–.60
York, Penn.—Sand, 1/10-in. down, 1.10; ¼-in. and less	1.00

*Cu. yd. †Fine sand. 1/10-in. down. ¶Gravel.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	4.30	.....
Ohlton, Ohio	1.75	1.75
San Francisco, Calif.	3.50	3.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Cheshire, Mass. (in carload lots)	5.00
Klondike, Mo.	2.00
Mendota, Va.	2.50–3.00
Ohlton, Ohio	2.50
South Vineland, N. J.	1.75
San Francisco, Calif.	4.00–5.00

***ROCK PRODUCTS** solicits volunteers to furnish accurate price quotations.*

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Buffalo, N. Y.	.....	.....	.....	11.00	.....	.....	.....	.....
Berkeley, R. I.	.....	.....	10.50	.....	.....	17.50	.....	19.25
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	.....	9.00c	9.00c	9.00c	7.50	9.00	8.50	.....
Frederick, Md.	.....	8.50	8.50	8.50	.....	8.50	6.50	13.50
Lime Ridge, Penn.	.....	.....	8.00	.....	6.50	7.50a	4.50	.....
W. Stockbridge, Mass.	.....	8.25	8.25	.....	.....	13.50	10.00	15.35
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.85	6.50	.....
Cold Springs, Ohio	.....	6.00	6.00	.....	.....	.....	6.00	.....
Martin, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	7.75	6.00	6.00	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	7.75	6.00	6.00	7.00	6.00	.....	6.00	.....
Luckey, Ohio	7.75	6.00	6.00	.....	.....	.....	.....	.....
Milltown, Ind.	.....	9.00	8.25	9.50	7.50	.....	7.00	.....
Sheboygan, Wis.	.....	10.50	10.50	.....	.....	.....	9.50	20.00e
White Rock Ohio	7.75	.....	6.00	.....	6.00	8.00	6.00	.....
Woodville, Ohio	7.75	6.00	6.00	9.00	6.00	8.00	6.00	15.00d
SOUTHERN:								
Keystone, Ala	.....	8.00	.....	7.50	.....	.....	6.50	13.75
Ocala, Fla.	17.25	10.00	10.00	11.00	.....	.....	10.50	1.50
Knoxville, Tenn.	.....	8.00	8.00	7.50	.....	.....	6.00	12.50
Pine Hill, Ky.	.....	8.00	8.00	7.50	.....	.....	6.00	12.50
WESTERN:								
Little Rock, Ark.	.....	14.30	.....	14.30	.....	.....	.....	17.40
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	15.00	.....
Los Angeles, Calif.	15.50	14.50	.....	.....	.....	.....	16.00	.....
San Francisco, Cal. (b)	20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	19.00	14.00	12.50	14.00	13.00	.....	11.00	.....

(a) In 100-lb. bags. (b) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (c) In 50-lb. paper. (d) In steel; in wood, 14.00. (e) In steel.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Bethlehem, Penn.	1.25	.50	1.00	.60	.70	.70	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.50	.60	1.00	.80	1.00	1.00	1.00
Pittsburgh, Penn.	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.05*	1.80*	1.45*	1.45*	1.45*	1.45*
Jackson, Ohio	2.05*	.65*	1.55*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.10	1.00‡	1.10	1.10	1.10	1.10	1.10
SOUTHERN:							
Ashland, Ky.	2.05*	1.05*	1.65*	1.45*	1.45*	1.45*	1.45*
Ensley & Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.25	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1½-in. to ¼-in., 1.05; ⅝-in. to 10 mesh, 1.25*; ⅝-in. to 0-in., 90c*; ¼-in. to 10 mesh, .80*. ‡Including dust.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200-mesh, 6.00 per ton in paper bags

Slate Granules

Pen Argyl, Penn.—Blue-Black, 6.00 per ton in bulk

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—						
Hardvein slate	8.00	13.50	20.00	25.00	30.00	35.00
Pen Argyl, Penn.—						
Graduated slate	.....	16.00	23.00	27.00	37.00	46.00

Albion blue-grey roofing slate, No. 1 clear 7.25; mediums 8.00; No. 1 ribbon 8.00.

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.

(b) Prices other than 3/16-in. thickness include nail holes.

(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Agricultural Limestone (Crushed)

Bedford, Ind.—Analysis, 98.44% $CaCO_3$; 0.83% $MgCO_3$; 90% thru 10 mesh 1.50

Cartersville, Ga.—50% thru 50 mesh 1.25

Chico, Tex.—Limestone flour, or mill floats, per 100-lb. bag, f.o.b. plant 1.00

Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder 3.50

Cypress, Ill.—90% thru 100 mesh, 1.25; 50% thru 100 mesh, 1.25; 90% thru 50 mesh, 1.25; 50% thru 50 mesh, 1.25; 90% thru 4 mesh, 1.25; and 50% thru 4 mesh 1.25

Davenport, Iowa — Analysis, 92-98% $CaCO_3$: 2% and less $MgCO_3$: 100% thru 4 mesh, 50% thru 20 mesh; bulk .. 1.10

Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton 1.70

Dubuque, Ia.—Analysis, 64.04% $CaCO_3$; 30.54% $MgCO_3$; 90% thru 50 mesh 1.05

Fort Spring, W. Va.—Analysis, 92% $CaCO_3$; 3% $MgCO_3$; 50% thru 50 mesh; bulk, per ton 1.15

Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh 1.25

Lannon, Wis. — Analysis, 54% $CaCO_3$, 44% $MgCO_3$: 99% thru 10 mesh; 46% thru 60 mesh 2.00

Screenings (¼-in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00

90% thru 50 mesh 2.00

90% thru 4 mesh 1.00

Marlbrook, Va.—Precipitated lime-marl. Analysis, 96% $CaCO_3$; 1% $MgCO_3$, 90% thru 50 mesh, bulk, 2.25; in burlap bags 3.75

Olive Hill, Ky.—90% thru 4 mesh, 50c; 50% thru 50 mesh, per ton 1.00

Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, and 45% thru 200 mesh, per ton a4.00

Piqua, Ohio—30%, 50% and 99% thru 100 mesh 1.00–4.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70

Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 50 mesh, bulk 100-lb. paper bags, 4.75; 100-lb., cloth .. 3.50 / 5.25

Waukesha, Wis.—90% thru 100 mesh, 3.85; 50% thru 100 mesh 2.10

*Less 25c disc. 15 days. (a) Less 25c disc. per ton.

Agricultural Limestone (Pulverized)

Alton, Ill. 4.50

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50

Cartersville, Ga. 1.75

Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton 6.00

Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags 4.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags 5.00

Jamesville, N. Y.—Bulk, 4.10; in 80-lb. bags 5.35

Joliet, Ill. 3.50

Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, in 100-lb. paper bags, 3.75; bulk 2.50

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00

Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.25

West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; bags, per ton, 3.75; bulk 2.50

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton .. 6.00

Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra) 3.50

Piqua, Ohio—99% thru 100 mesh, bulk, 3.25; in 80-lb. or 100-lb. bags 4.25

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.10

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh 20.00

30– 60 mesh 22.00

60–100 mesh 18.00

100 mesh and finer 9.00

Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, incl. cost of bags 24.00

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.00– 7.50

1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Clifton, Va.:
Ground talc (150-200 mesh), in bags 10.00

Emeryville, N. Y.:
Ground talc (200 mesh), bags 13.75
Ground talc (325 mesh), in bags 14.75

Hailesboro, N. Y.:
Ground talc (300-350 mesh), in 200-lb. bags 15.50–20.00

Henry, Va.:
Crude (mine run), bulk 3.50– 4.00
Ground talc (150-200 mesh), in bags .. 6.25–11.00

Los Angeles, Calif.:
Ground talc (150-200 mesh), in bags .. 15.00–25.00

Natural Bridge, N. Y.:
Ground talc (325 mesh), bags 10.00–15.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn. 4.25– 4.75

Mt. Pleasant, Tenn.: (Screened)
B.P.L. 75%, furnace lump 6.50
B.P.L. 72%, run of plant lump & fines 5.50

Ground Rock (2000 lb.)

Gordonsburg, Tenn. 5.25– 6.00

Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra 12.80

Mt. Pleasant, Tenn.—B.P.L. 72% 5.50

Florida Phosphate (Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines

68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.79½	3.18	.....
Atlanta, Ga.	.....	†2.00	3.30¶
Baltimore, Md.	.....	†2.02	3.32¶
Birmingham, Ala.	.....	†1.66	2.96¶
Boston, Mass.	.46	†1.84	3.14¶
Buffalo, N. Y.	.45½	†1.82	3.12–3.22¶
Cedar Rapids, Ia.	.....	2.23*	.....
Charleston, S. C.	.....	1.89†	3.19¶
Cheyenne, Wyo.	.58	2.32	.....
Chicago, Ill.	.....	1.79†	3.04¶
Cincinnati, Ohio	.....	1.80†	3.05¶
Cleveland, Ohio	.....	1.80†	3.05¶
Columbus, Ohio	.....	1.80†	3.05¶
Dallas, Tex.	.....	1.79	3.49¶
Davenport, Iowa	.....	2.14*	.....
Dayton, Ohio	.....	1.80†	3.05¶
Denver, Colo.	.60¼	2.41†	3.66¶
Des Moines, Iowa	.47¾	1.91†	3.16¶
Detroit, Mich.	.....	1.85†	3.10¶
Duluth, Minn.	.....	2.04*	.....
Houston, Tex.	.....	1.89–2.00*	3.73¶
Indianapolis, Ind.	.54¾	1.79†	3.04¶
Jackson, Miss.	.....	2.10†	3.40¶
Jacksonville, Fla.	.....	2.33†	3.63¶
Jersey City, N. J.	.....	†1.99	3.29¶
Kansas City, Mo.	.38¾	1.55†	2.80¶
Los Angeles, Calif.	.57½	2.30	.....
Louisville, Ky.	.....	1.94†	3.19¶
Memphis, Tenn.	.....	†2.03	3.33¶
Milwaukee, Wis.	.....	1.94†	3.19¶
Minneapolis, Minn.	.....	2.27*	.....
Montreal, Que.	.....	1.60‖	.....
New Orleans, La.	.....	1.91†	3.21¶
New York, N. Y.	.46	†1.84	3.19¶
Norfolk, Va.	.....	1.97*	3.27¶
Oklahoma City, Okla.	.52	†2.08	3.33¶
Omaha, Neb.	.47½	†1.89	3.14¶
Peoria, Ill.	.....	2.12*	.....
Pittsburgh, Penn.	.....	†1.81	3.11¶
Philadelphia Penn.	.....	†2.01	3.31¶
Portland, Ore.	.60	2.50‡	.....
Reno, Nev.	.....	2.96‡	.....
Richmond, Va.	.....	†2.18	3.48¶
San Francisco, Calif.	.....	2.24‡	.....
Savannah, Ga.	.....	1.89†	3.19¶
St. Louis, Mo.	.48¾	†1.60	2.85¶
St. Paul, Minn.	.....	2.27*	.....
Seattle, Wash.	.....	1.50–1.55	2.50c
Tampa, Fla.	.....	2.00†	3.30¶
Toledo, Ohio	.....	1.80†	3.05¶
Topeka, Kan.	.44½	1.78†	3.03¶
Tulsa, Okla.	.49¾	1.99†	3.24¶
Wheeling, W. Va.	.....	†1.80	3.10¶
Winston-Salem, N.C.	.....	2.44*	3.74¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Bonner Springs, Kan.	.....	1.85	3.15¶
Buffington, Ind	.....	1.44†	.....
Concrete, Wash.	.....	2.65	.....
Dallas, Tex.	.....	1.74	.....
Hannibal, Mo.	.....	1.66†	.....
Houston, Tex.	.....	1.84	.....
Hudson, N. Y. (d)	.....	2.21†	3.26¶
Independence, Kan.	.....	1.71†	.....
Leeds, Ala.	.....	1.46†	.....
Limedale, Ind.	.....	1.50	.....
Lime & Oswego, Ore.	.....	2.50	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.51†	.....
Steelton, Minn.	.....	1.61†	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.46†	.....
Waco, Tex.	.....	1.75†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. ‖Includes sales tax. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days. (d) By truck.

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Rumney Depot, Bristol and Cardigan, N. H.—Per ton:	
Punch mica, per ton	150.00–240.00
Mine scrap	22.50
Mine run	325.00
Clean shop, scrap	25.00
Roofing mica	37.50
Ground mica, per ton, 20 mesh, 37.50; 40 mesh, 40.00; 60 mesh, 40.00; 100 mesh, 45.00; 200 mesh	60.00
Spruce Pine, N. C.—Mine scrap, per ton	18.00– 20.00

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N.Y.—Bio-Spar, per ton in bags, in carload lots, 9.00; less than carload lots, per ton in bags	.....	12.00
Crown Point, N. Y.—Mica Spar	.....	¶9.00f–‖12.00
Davenport, Ia. — White limestone, in bags, ton	‖6.00	‖6.00
Los Angeles, Calif.—(e) White	¶12.00–‖14.50	¶12.00–‖14.50
Snowflake	.....	¶12.00–‖14.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(e) White	¶9.80– ‖9.80	¶9.80– ‖9.80
Snowflake	.....	¶9.80– ‖9.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red	.....	20.00– 25.00
Middlebury, Vt.—White	.....	¶9.00–‖10.00
Middlebury & Brandon, Vt. — Caststone, per ton, including bags	.....	c5.50
Randville, Mich.—Crystalite, crushed white marble, bulk	4.00	4.00– 7.00
Tuckahoe, N. Y.	6.00	.....
Warren, N. H. (d)	.....	¶8.00– 8.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L. (d) L.C.L., 9.50-15.00 per ton in 100-lb. bags (e) Including bags. (f) In bags.

Art and Cast Stone Aggregates

Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust a	4.70 .....

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Chicken Grits

Cypress, Ill.—(Agstone), per 100-lb. sack	.90
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack, f.o.b. Chico	1.00
Cranberry Creek, N. Y.—Packed in 100-lb. bags	¶9.00–12.00‖
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
El Paso, Tex.—(Limestone), per 100-lb. sack	.75
Gibsonburg, Ohio—(Agstone)	10.00
Joliet, Ill.—(Agstone)	10.00
Los Angeles, Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, Ohio—(Pearl grit), No. 1 and No. 2	1.00– 4.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), per ton, bulk	6.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Potash Feldspar

Erwin, Tenn.—White; analysis, K_2O, 10.50%; Na_2O, 2.75%; SiO_2, 67.75%; Fe_2O_3, .08%; Al_2O_3, 18.00%, pulverized, 98% thru 200 mesh, in bags, 16.00; bulk	15.00
Crude, in bags, 7.50; bulk	6.50
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	15.00
Trenton, N. J.—Color, white; analysis, K_2O, 12%; Na_2O, 3%; SiO_2, 69%; Fe_2O_3, 0.06%; Al_2O_3, 18%; pulverized, 98% thru 200 mesh; bulk, 20.00; in bags	21.20
West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk	19.00
Rochester, N. Y.—Color, white; analysis, K_2O, 12.50%; Na_2O, 2.25%; SiO_2, 65%; Fe_2O_3, 0.04%; Al_2O_3, 19.10% pulverized 98% thru 200 mesh; in bags, 23.50; bulk	22.00

Granular Glasspar

(Chemically Controlled)

Spruce Pine, N. C.—Color, white; analysis, K_2O, 7.20%; Na_2O, 3.70%; SiO_2, 70%; Fe_2O_3, 0.05%; Al_2O_3, 17.50%; per ton, in bulk	10.50

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh	18.00
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	18.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq.	9.50–12.00
Closed end shingle, 8½x12½ in., per sq.	11.00–13.00
New Castle, Penn.—Red, 9x15-in.	12.00
Green, 9x15-in.	15.00
New York City, N. Y.:	
Red, per square	10.00–12.00
Green, per square	12.00–15.00

Cement Building Tile

Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000	60.00
4x8x12, per 1000	70.00
Prairie du Chien, Wis.:	
5x8x12, per 1000	78.00
5x4x12, per 1000	46.00
5x8x6, per 1000	41.00

Wichita, Kan.: (Duntile)	Plain	Glazed
8x8x12. Each	.10½	.14
6x8x12. Each	.09½	.13
4x5x12. Each	.05	.08
4x4x12. Each	.04½	.07½

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Beloit, Wis.	18.00	26.00– 35.00
Ensley, Ala., "Slagtex"	12.50	.....
Longview, Wash.	16.50	22.50– 45.00
Milwaukee, Wis.	14.00	20.00– 35.00
Omaha, Neb.	15.00	.....
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	16.00	30.00

*Price f.o.b. plant. †Delivered on job in city.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Beloit, Wis.:	
4x8x16. Each	.11
6x8x16. Each	.13
8x8x16. Each	.15
10x8x16. Each	.19
12x8x16. Each	.21
Brookville, Penn.: 8x8x16	20.00§–23.00a
8x10x16	25.00§–28.00a
Camden, N. J.: 8x8x16, each	.18b
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*
Omaha, Neb.: (c)	
8x 4x16, each	.06½§
8x 8x16, each, .10§; 8x12x16, each	.15§
Passaic, N. J.: 8x8x16 in. Each	.16
12x8x16 in. Each	.24
Wichita, Kan.: 8x8x16. Each	.11§

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 10%. (c) Faced block, priced 2c higher than plain block prices quoted.

Cement Drain Tile

Grand Rapids, Mich.—Drain tile, per 1000 ft.			
4-in.	40.00	15-in.	325.00
5-in.	50.00	18-in.	450.00
6-in.	75.00	20-in.	600.00
8-in.	110.00	22-in.	750.00
10-in.	165.00	24-in.	850.00
12-in.	190.00		

Longview, Wash.—Drain tile, per foot			
3-in.	.06	8-in.	.18
4-in.	.08	10-in.	.25
6-in.	.12	12-in.	.35

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in
Grand Rapids, Mich. (a)																	
Sewer	.....	.12	.18–.20	.27½	.35	.57½	1.00	1.11	1.48	1.66	.....	.....	.....	.....	.....	.....	...
Culvert	.....	.....	.....	.57	.67	.93	1.20	.....	1.48	1.80	2.10	2.25	3.35	4.00	5.10	5.85	7.42
Longview, Wash.	.17½	.24½	.30	.42	.60	.90	1.26	.....	.....	2.16	.....	3.60	4.50	5.50	6.50	7.50	.....
Mercedes, Texas																	
Tongue and groove..	.16	.20	.23	.29	.35	.....	.74	.91	.....	1.38	.....	2.28	.....	.....	.....	.....	.....
Sewer	.16	.22	.32	.41	.53	.78	1.05	.....	.....	1.98	.....	.....	.....	.....	.....	.....	.....
Milwaukee, Wis.						Cast stone window sills, 5 in. x 5½ in., 50c per lineal ft.											
Tiskilwa, Ill. (c)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

†21-in. diam. (a) Sewer pipe, 21-in., 1.29; culvert, 21-in., 1.45. (b) Reinforced, 15.40 per ton, f.o.b. plant. (c) Reinforced.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36": Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.													
Grand Rapids, Mich.	.....	.....	6.00b	10.00b	10.00b	10.00b	19.50b	8.00b	26.00b	21.00b	15.00	15.00	27.00
Los Angeles, Calif. (a)	.....	7.50	7.50	12.20	12.20	.....	13.20	.....	29.00	.....	.....	.....	.....
Medicine Lodge, Kan.	1.40	.....	.....	.....	.....	.....	11.50b	.....	16.00b	11.50b	.....	.....	.....
Oakfield, N. Y.	.....	.....	.....	6.00	9.00b	9.00b	.....	6.00b	.....	.....	.....	.....	.....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00p	10.00q	10.00q	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Rumford, R. I. (n)	.....	.....	.....	14.00m	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	.....	14.90b	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	—	—	.....	.....	20.00	25.00e	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) ⅜-in. plaster lath, 16c per sq. yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (e) ⅜x48-in. by 3 to 4 ft. long. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (m) In jute sacks, delivered in Providence, R. I. (n) Gypsum block, 2-in., 6c per foot; 3-in., 7c per foot. (p) To 12.00. (q) To 13.00.

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans La.	35.00	45.00	60.00
Norfolk Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x 4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

New Operators for Gravel Plant in North Carolina

THE SOUTHERN GRAVEL CO., which purchased the plant and holdings of the old Southern Sand and Gravel Co., located on the Atlantic and Western Railway Co., 20 miles east of Sanford, N. C., will in the near future begin operations. Junius H. Harden of Burlington is president and E. L. Henderson of Burlington secretary and treasurer of the company. Mr. Henderson will be in active charge with offices in Sanford. He expects to move his family here in the near future. The Southern Sand and Gravel Co. organized in 1927 was placed in receivership in 1928. The company owned much land with large deposits of gravel and has leases on adjoining property. Experts have pronounced the deposits of excellent quality.—*Raleigh* (N. C.) *News and Observer.*

Badger Producer Gets Permit

PERMISSION for the installation of needed machinery was granted to the Manitowoc Sand and Gravel Co., at its leased grounds on N. Eighth Street, near the north city limits, Manitowoc, Wis., by the Board of Appeals at its meeting at the city hall recently. It was necessary for the board to take action after permit for the installation had been refused by the building inspector's department owing to the location being in a territory reserved by the zone rule for other purposes.—*Manitowoc* (Wis.) *Herald-News.*

Building Material Prices

THE figures given below, compiled by the Department of Commerce, show revised average prices paid March 1 by contractors, delivered.

City	Portland cement, per bbl., exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.90	.....	$20.00	$1.25	$2.25	.....
New London, Conn.	2.80	$25.00	.....	1.50	2.40	$18.00
Waterbury, Conn.	3.00	30.00	20.00	1.35	2.45	20.00
Haverhill, Mass.	2.80	25.00	20.00	.....	.....	18.50
New Bedford, Mass.	2.80	24.00	16.50	1.75	3.00	16.50
Albany, N. Y.	2.97	24.75	18.00	.....	.....	15.30
Buffalo, N. Y.	2.95	21.00	18.00	2.50	2.05	16.00
Poughkeepsie, N. Y.	2.18	.....	.....	2.25	2.00	.....
Rochester, N. Y.	3.25	22.00	20.00	1.75	2.40	17.00
Paterson, N. J.	2.40	25.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Philadelphia, Penn.	2.30	.....	14.50	1.75	2.60	17.50
Scranton, Penn.	2.80	.....	20.00	3.25	.....	19.00
Baltimore, Md.	2.40	25.00	13.50	2.75	2.75	14.50
Washington, D. C.	2.23	25.00	13.00	.....	.....	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmont, W. Va.	2.80	35.00	16.00	3.15	3.50	18.00
Columbia, S. C.	2.35	35.00	12.00	1.50	2.75	14.40
Atlanta, Ga.	2.38	.....	17.50	2.31	2.30	16.90
Tampa, Fla.	3.00	.....	24.00	2.00	4.50	.....
Savannah, Ga.	2.25	25.00	20.00	2.00	.....	16.00
Shreveport, La.	3.20	39.00	.....	2.00	3.80	22.00
Birmingham, Ala.	2.70	40.00	.....	3.00	2.50	.....
Erie, Penn.	2.40	22.50	19.00	2.00	.....	16.00
Akron, Ohio	2.67	36.00	18.00	1.85	1.85	.....
Canton, Ohio	2.95	.....	$16.00	$2.50	$3.00	.....
Cincinnati, Ohio	2.62	$24.75	14.40	2.63	2.55	.....
Cleveland, Ohio	2.40	.....	12.00	1.95	2.70	$14.50
Columbus, Ohio	2.35	35.00	12.00	1.50	2.75	14.40
Toledo, Ohio	2.22	20.00	12.00	1.75	2.50	14.50
Youngstown, Ohio	2.95	.....	20.00	3.75	2.50	.....
Lansing, Mich.	2.90	.....	22.00	2.25	.....	16.50
Saginaw, Mich.	2.60	25.00	18.00	2.50	3.25	17.00
Terre Haute, Ind.	2.85	28.00	18.00	1.65	3.25	18.00
Louisville, Ky.	2.32	.....	15.50	2.20	2.43	17.00
Rockford, Ill.	2.80	25.00	20.00	1.60	1.15	16.00
Milwaukee, Wis.	2.08	22.00	14.00	1.50	1.50	15.20
Des Moines, Iowa	3.08	.....	20.00	1.10	.....	.....
Kansas City, Mo.	2.30	25.00	24.00	1.70	2.25	15.00
St. Louis, Mo.	2.15	.....	18.00	1.35	1.00	18.00
St. Paul, Minn.	2.45	.....	18.00	2.23	1.75	18.00
Grand Forks, N. D.	3.00	.....	25.00	2.60	.....	20.00
Sioux Falls, S. D.	3.00	.....	24.00	1.25	2.25	15.00
San Antonio, Texas	2.60	.....	20.00	2.25	2.35	19.15
Tucson, Ariz.	3.37	.....	30.00	1.25	2.00	17.70
Denver, Colo.	2.20	35.00	22.00	1.25	1.45	18.00
Los Angeles, Calif.	2.30	.....	28.50	1.85	1.90	15.20
San Francisco, Calif.	2.42	.....	22.50	1.40	1.60	19.90
Seattle, Wash.	1.75	.....	22.00	1.40	1.90	20.00

News of All the Industry

New Incorporations

O'Connell Lime Co., 50 Union Square, New York City, $2.000. D. C. Robertson.

Princeton Fluorspar Co., Princeton, Ky. John Huhgett and Lem Conger.

Western Sand and Gravel Co., Amarillo, Tex., increased capital stock from $30,000 to $80,000.

Multiplex Concrete Co., incorporated in New Jersey, $25,000. To produce cement products.

National Concrete Pipe Co., 802 Majestic Bldg., Detroit, Mich., $500,000.

Maspeth Sand and Gravel Co., 46-48 Columbia St., Brooklyn, N. Y. Francisco Arguelles and Antonio Carabe.

Keller Quarry Co., Grafton, Ill., 200 shares of no par value. Eugene Keller, Charles W. Keller and A. L. Smith.

Manitowoc Sand and Gravel Co., Manitowoc, Wis., $5000, consisting of 50 shares at $100 each. Irving Fricke, Charles Fricke and Amy Fricke.

Michigan Material and Concrete Co., Centerville, Mich., $40,000. To operate gravel pits, produce concrete, building materials and supplies.

Victoria Materials and Gravel Co., Victoria, Tex., $25,000. O. L. Neyland, C. C. Carsner and Gertrude L. Richey.

John B. Helfert and Co., Inc., Richmond, Va., $50,000. John B. Helfert, president. To engage in mining and quarrying.

Lexington Products Corp., Richmond, Va., $300,000. Frank T. Cucker, Land Title Bldg., Philadelphia, Penn. To produce lime and its byproducts.

Great Lakes Foundry Sand Co., Detroit, Mich., incorporated to operate in Indiana. F. Herrick, Hillsdale, Ind., agent.

Welch-Sandler Sand Co., Kansas City, Mo., $50,000. Casimir J. Welch, 717 E. 15th St., Kansas City, Mo.

People's Concrete Block and Sand Co., Rochester, N. Y., $15,000. Enrico, Cosimo and Antonio Palumbo, all of Rochester.

Western Wisconsin Gravel Co., La Crosse, Wis., 600 shares at $100 each. A. J. Rasmussen, E. Bigham and L. A. Kennedy.

Ottumwa Sand Co., Ottumwa, Ia., $10,000. C. L. Mikesh, president, and C. J. Mikesh, secretary-treasurer.

Independent Sand Co., Wheeling, W. Va., $50,000, consisting of 500 shares at $100 each. Carl O. Schmidt, Wright Hughes, Kathryn Archer, Kathryn Steen and Hazel Wallace.

Liberty Gravel Co., Inc., Gloster, Miss., $6000. A. S. Madding, Pine Bluff, Ark.; C. E. Fish, Star City, Ark., and S. A. Gano, Jackson, Miss. To produce sand and gravel.

Twin City Barge and Gravel Co., Minneapolis, Minn., 1000 shares, par value $100 each. J. A. Campbell, C. T. Welch and L. M. Derby, all of Minneapolis.

Tipton-Hamilton Gravel Corp., Tipton, Ind., 1000 shares, par value $10 each. W. W. Mount, C. M. Martz, H. C. Haskett, N. R. Lebo, I. H. Woodruff, Walter Carter and C. W. Mount.

Union Sand and Gravel Co., Wilmington, Del., 10,000 shares of no par value. C. S. Peabbles, L. E. Gray and H. H. Snow. To deal in sand, gravel, plaster, stone, marble, etc.

Quarries

Amalgamated Sugar Co., Missoula, Mont., has opened its Drummond quarries for the production of limestone to be used in its sugar refining process.

Concrete Materials Corp., Bethany, Mo., resumed operations recently to furnish stone for state highway work.

France Stone Co., North Baltimore, Ohio, has completed the addition of a washing plant to its quarry operation.

George Washington Stone Corp., Alexandria, Va., is rebuilding a portion of its pant, including loading, conveying and other equipment, recently destroyed by fire, with a loss of about $45,000.

Princeton, Mo.: The state highway department has leased a quarry on the H. R. Wayman farm, 4½ miles west of Princeton, and will lease the operation to a contractor.

Sturgeon Bay Co., Sturgeon Bay, Wis., has resumed operations after its winter shutdown, and according to a statement made to the local press by Norman Hanson, general manager of the company, the outlook is bright for a good season.

E. H. France Granite Co., Macon, Ga., filed a voluntary petition in bankruptcy in the federal court recently with liabilities of $15,410 and assets of $21,567.

Feyen Construction Co., St. Paul, Minn., has been denied an application to operate a rock crushing plant at Livingston avenue and Winifred street, St. Paul. The city council denied the permit following protests from about 100 property owners.

Brown and Root, contractors, Ft. Stockton, Tex., suffered the loss of their portable rock crushing plant recently through an explosion. It is believed that labor trouble is responsible for the dynamiting of the plant.

Youghiogheny Crushed Stone Co., Connellsville, Penn., is carrying out an extensive expansion program at its Casparis quarries about seven miles from Connellsville, to cost over $100,000. George Vang is president of the company.

Thunder Bay Quarries Co., Alpena, Mich., is rapidly developing its property between Ford avenue and Thundred Bay shore, with offices at 1541 Ford Ave., Alpena. The company expects to begin quarry operations by August 1, 1931.

Bear Mountain Quarries, Fredericksburg, Tex., suffered an accident to one of its quarry employes who was struck on the head by a piece of rock hurled by a blast. It was expected that the accident would prove fatal.

C. C. Brodie, Lyons, Colo., is installing electric flood lights in order to provide for work in two shifts for the next five months. Mr. Brodie operates the Lyons red sandstone quarries for crushed stone.

Winterset Limestone Co., Winterset, Ia., has been awarded the contract for 40,000 tons of crushed rock to be used on state highway No. 2. The new company will open its quarry three miles east of Winterset. Carl Cassburg of Des Moines, Ia., is designing the plant.

Carbon Limestone Co., Youngstown, Ohio, has been refused a revision of the freight rates recently put into effect by the Interstate Commerce Commission, which applies a 20% arbitrary charge on joint-line hauls. The Carbon Limestone Co., which operates quarries near Hillsville, Penn., is located on the Pittsburgh and Lake Erie railroad and it was contended it is unable to reach many points without two-line hauls, which makes it difficult for the company to compete with other quarries located on the Pennsylvania railroad with single-line hauls.

Sand and Gravel

Prospect Sand and Gravel Co., Milwaukee, Wis., is reported to be in bankruptcy.

Wapak Sand and Gravel Co., Wapakoneta, Ohio, entertained contractors, citizens and county highway officials at its improved plant on March 31.

Triangle Rock and Gravel Co., Ely, Nev., has started operations to furnish gravel for the state highway from Mormon Mesa to the Virgin river.

R. H. Wallace, Lapwai, Idaho, is developing a sand and gravel pit south of the town for the preparation of commercial sand and gravel, particularly for road work.

New Martinsville Sand and Gravel Co., New Martinsville, W. Va., J. W. Harman, manager, is placing its dredge in operation to supply crushed gravel for the New Martinsville-Clarksburg road.

Eads Sand Co., Mississippi Valley Trust Bldg., St. Louis, Mo., is reported to be spending $20,000 for improvements at its plant on Spruce St., St. Louis.

Oil City Sand and Gravel Co., Oil City, Penn., has received a contract to provide 120 carloads of gravel for improvement of roads in Allegheny National Park.

Foster O. Spencer and **Clarence I. Holt**, Los Angeles, Calif., have been enjoined from operation of their sand and gravel plant between the hours of 6 p. m. and 8 a. m. or on Sundays, because of the objection of neighbors to the noise.

McCrady-Rodgers Co., Pittsburgh, Penn., suffered the loss of one of its tow boats, the "Homer Smith," which was burned recently. The boat was an old excursion steamer which the company bought in the spring of 1930.

Arkadelphia Sand and Gravel Co., Arkadelphia, Ark., whose plant was destroyed by a runaway freight car, as illustrated in ROCK PRODUCTS, March 28, page 85, has completely rebuilt its plant and placed it in operation again.

Jones-Lemmon Co., Piru, Calif., is enlarging its new plant to have a capacity of 30 cars per day. Original plans called for a 20 car per day plant. J. L. Lemmon is president of the company and D. L. Lemmon is in charge of the construction work.

Northport Sand and Gravel Co., Northport, N. Y., has been awarded the contract for construction of the first of twin locks at London, on the Kanawha river, at Montgomery, W. Va. The company's bid was $844,782, the work to be completed by July 31, 1932.

Memphis Stone and Gravel Co., Camden, Tenn., is enlisting the aid of local newspapers and the local chamber of commerce to fight the recent increase in freight rates ordered by the Interstate Commerce Commission between Camden and Memphis and to points in Mississippi, from 79 cents to $1.30. It is contended that this increase in rates will put the plant out of business.

Material Service Corp., Chicago, Ill., opened the season March 27 by putting its river barge, "Material Service," owned and operated by the Leathem Smith, Putnam Navigation Co., from Lockport to Chicago. The tonnage this season, to be removed by barge from the company's plant at Lockport on the Chicago drainage canal to its Chicago yards, is expected to equal that of last year, which was 506,000 cu. yd.

Cement

Alpha Portland Cement Co., Birmingham, Ala., recently entertained a group of senior engineering students of the University of Alabama at its plant.

Lawrence Portland Cement Co. has moved its New York office to 270 Broadway, opposite City Hall Park.

Dewey Portland Cement Co., Independence, Mo.: A workman sustained a possible skull fracture recently when a piece of machinery struck him on the head during the reconstruction work now in progress at the plant.

Pennsylvania-Dixie Cement Corp. has the longest no-accident record at its No. 4 quarry at Nazareth, Penn., of any quarry in the state of Pennsylvania, according to the records of the Department of Labor and Industry. It has completed five years of consecutive operation without a lost-time accident.

Salt Lake City, Utah: Equalization of freight rates on cement from Utah points to the Hoover dam site with rates from southern California to the same location is requested of the Union Pacific railroad by the Utah Shippers' Traffic Association. The present rates are 36c per 100 lb. from Utah and 30½c per 100 lb. from California.

Utica Hydraulic Cement Co., Utica, Ill., recently elected Robert Dettlebach, son of F. C. Dettlebach, president of the company, to its board of directors. F. C. Dettlebach was re-elected president; J. A. Conley, vice-president; S. M. Spillan, secretary-treasurer, and H. B. Howells, chairman of the board of directors.

Manitowoc Portland Cement Co., Manitowoc, Wis.: Employes of the company have enlisted the aid of State Senator John E. Cashman of the Manitowoc district to file a petition asking for the allocation of cement contracts to the Manitowoc company when its bid may be low or tied with those of other companies. The plant was shut down on March 13 for lack of orders.

Slate

Norton Bros., Pawlet, Vt., suffered a slight loss from fire which destroyed the engine house at their quarry.

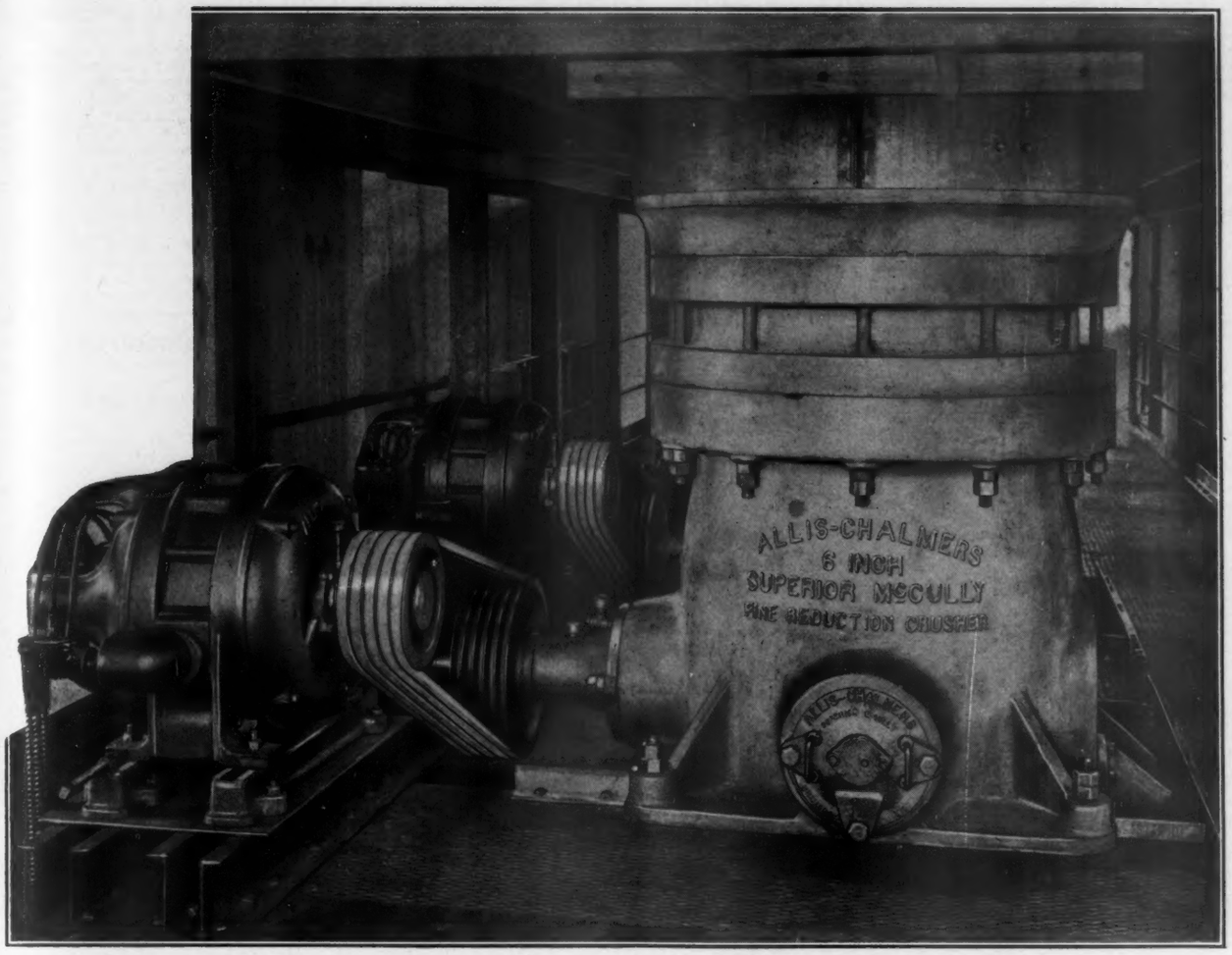
Bangor Ideal Slate Co., Pen Argyl, Penn., is reported to have resumed operations after several months' shutdown.

Columbia-Bangor Slate Co., Pen Argyl, Penn., reported idle since April of last year, started operations recently, giving employment to about 60 men.

Cement Products

Oscar Magill and son, **Ralph Magill**, have purchased from the Elmer Thomas heirs the Augusta Concrete Works, Augusta, Ill., and will reopen the plant for the manufacture of building blocks, porch posts, lawn rollers, etc.

McCray and Daniels, Willoughby, Ohio, have recently completed a new plant for the manufacture



Two 6-inch Fine Reduction Crushers installed in the crushing plant of the Arrow Sand & Gravel Company, Columbus, Ohio. These crushers are driven through Allis-Chalmers motors and Texrope Drives.

Producing a Uniform Product at Low Cost

THE Superior McCully Fine Reduction Crusher fits in well with modern crushing conditions which demand a uniform product at low cost. This reduction crusher has high capacity, dependability and strength. It is built and serviced by Allis-Chalmers, a pioneer in the development of the gyratory crusher and today one of the world's leading manufacturers of crushing and grinding machinery.

This crusher is simple in construction, with all parts readily accessible. It has a short, rigid, hollow bored, forged steel main shaft; large cast steel eccentric; cut steel gears; positive, patented oiling system; and reversible top shell with vertical concaves. These features insure long life and freedom from shut-downs for repairs. Superior McCully Fine Reduction Crushers are built in three sizes, with receiving openings of 6, 10 and 18 inches. They are described in Bulletin 1461-A.

CRUSHING AND SCREENING MACHINERY FOR EVERY TYPE OF PLANT

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

When writing advertisers, please mention ROCK PRODUCTS

of cement and concrete products and are now marketing these under the trade name of "Stone-Age" concrete products. Their chief output at the present time is concrete block, brick and hearth tile. The concrete brick are manufactured in any color desired, as are also the hearth tiles.

L. L. Autry, Charlotte, N. C., has bought the Duntile Cement Products Co. plant on Down Road and organized a new company to be known as the Autry Concrete Works. Mr. Autry was formerly foreman of the Duntile Cement Products Co. and is thoroughly experienced in cement products manufacture. His new business will specialize in drain tile, building tile and cement products, including colored tile.

General Material Co., St. Louis, Mo., has prepared in editorial reprint form, the article entitled, "Ready-Mixed Concrete in the St. Louis District," which was published in ROCK PRODUCTS, January 17, 1931. They are mailing it to all those they deem interested in ready-mixed concrete. The article gives a complete description of the operations of this company in the St. Louis district.

Miscellaneous Rock Products

C. B. Bell of Canon City, Colo., is reported to be opening a mica mine near Guffey, Colo.

Southwestern Consolidated Graphite Co., Granger, Tex., was recently sold at public auction by the sheriff in foreclosure proceedings to a buyer reported to be the Ceylon Co., which was plaintiff in a suit to satisfy an indebtedness against the company. The property was secured for $10,000 and it is rumored that the new owners will reopen the plant.

Burnsville, N. C.: J. A. Pollard, president of the Yancy Graphite Co., is reported to have leased the cyanite deposits of a 500-acre tract in the Black Mountain district to a mining company with headquarters in New York. Reports state that the lessee has finished construction of an experimental mill at the mine and as soon as details are arranged will begin construction of a permanent mill. J. T. Tower, mining engineer, 15 W. 38th St., New York City, is supervising the project, and V. L. Mattson, New York City, is resident engineer. It is said that Mr. Mattson has perfected a concentration process by which the cyanite will be produced.

Southern Feldspar Co. of Toecane, near Bakersville, N. C., recently leased feldspar property, belonging to Z. H. Young, located in Young's Cove, near Bakersville. The lease covers several mines and is for a period of five years, with the privilege of renewal. The company is reported to have made several tests of the deposit and to have proved it of high-grade potash and soda feldspar. It is reported that the mines will be subleased by the company to contractors immediately to develop the property. If the feldspar is sufficient to warrant it, the company expects to install modern mining machinery and operate the property on a large scale. The rock will be hauled by motor truck to the mill at Toecane.

Obituaries

Jason E. Burleson, 79, of Spruce Pine, N. C., one of the principal operators of mica quarries in the state, died April 3 at Atlanta, Ga., while on a business trip there.

Beverly L. Worden, president of Cutler-Hammer, Inc., Milwaukee, Wis., passed away. He had recently undergone an operation and his health had been bad for several months.

Frederick W. Bruch, 79, president of Standard Fuller's Earth Co. of America, and president of Acme Machinery Corp., died recently in Cleveland, Ohio.

Philip O. Schleussner, first vice-president and director of the Roessler and Hasslacher Chemical Co., Niagara Falls, N. Y., died March 21. He was born in Brooklyn, N. Y., September 6, 1878, and in 1906 went to the Roessler and Hasslacher Chemical Co. in charge of its Platinum Division. He eventually became manager of sales of all the company's products and in 1928 became first vice-president.

John Stehn of Minnesota City, Minn., treasurer of the Winona Sand and Gravel Co., and prominent for many years in Winona social and fraternal organizations, died March 10. He was born in Minnesota City, November 9, 1871, and for the past six years had been connected with the Winona Sand and Gravel Co. Prior to that time he was in the concrete contracting business. He was a former mayor of Minnesota City and a prominent Mason and Oddfellow. Besides his widow, two sons, Lloyd, of Winona, and Everett, of Minnesota City, survive.

Personals

Daniel E. Ritter, vice-president of the Lehigh Portland Cement Co., Allentown, Penn., was recently elected president of the Livingston Club of that city at its 41st annual business meeting.

R. H. McFetridge, superintendent of the Birmingham plant of the Lehigh Portland Cement Co., has been elected president of the Birmingham Safety Council. Hugh Morrow of the Sloss-Sheffield Co. was elected vice-president.

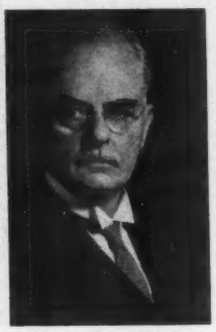
John H. Pearce of the Pioneer Sand and Gravel Co., Seattle, Wash., is reported to have purchased 11 mining claims east of the Sister mountains in Washington. The claims are reported to contain chromium ore.

W. R. Sanders, state representative of the Lehigh Portland Cement Co., recently addressed the Johnson City, Tenn., and Jonesboro Kiwanis clubs in Johnson City on "Construction in the World Today."

R. S. Phillips of the Portland Cement Association, New York City, recently addressed the Kiwanis Club of Birmingham, Ala., on the progress in the construction industry, featuring his talk with lantern slides showing notable examples of monolithic concrete. A large number of representatives of the cement industry of Birmingham were guests of the club.

R. E. Copeland of the Portland Cement Association, Chicago, recently addressed a meeting of members of the construction industry at Charlotte, N. C., on methods of making concrete. Mr. Copeland stressed particularly the demand for color and gave the latest information on how to incorporate color in concrete mixtures.

William A. Hammann has brought to a close a business career of almost half a century in the chemical manufacturing industry with his retirement as chairman of the board and director of Roessler and Hasslacher Chemical Co., New York, N. Y. The company operates several plants, producing a variety of chemicals used in many industries. Mr. Hamann's long service with the company encompassed every division of the business from clerk to president. He will now spend his time in travel and the development of enterprises in which he finds relaxation and pleasure.



W. A. Hamann

Wm. G. Praed has just been appointed by the Claud S. Gordon Co., Chicago, Ill., chemical, metallurgical, and high-temperature industrial engineers, as radiograph engineer to take charge of the new laboratory recently installed at 2416 W. 15th Place, Chicago. Mr. Praed was associated with Bethlehem Steel Co. during the war and since that time with Link-Belt Co. He has been closely identified with the American Society for Steel Treating since its organization and was twice chairman of its Indianapolis section.

George G. Landis has recently been appointed to chief engineer of Lincoln Electric Co., Cleveland, Ohio. He has been employed by General Electric Co. and Westinghouse Electric and Manufacturing Co. For the past eight years he has been in charge of experimental work for Lincoln Electric Co. Many of the patents held by the company are the result of his inventions.

A. S. Durrant, for the past six years vice-president in charge of commercial relations of the International General Electric Co., retired from active service on March 1 and was made an honorary vice-president of the company, following a connection of 40 years with the General Electric organization.

Howard H. Leh, manager of the Keystone Portland Cement Co., Bath, Penn., recently delivered an address at the Bethlehem, Penn., Rotary Club at the Hotel Bethlehem. Mr. Leh's subject, "Liquid Stone," was illustrated with a three-reel motion picture showing the manufacture of cement in a modern wet process plant. Pictures were also shown on the construction materials used by the ancient Greeks and Romans and in the Renaissance architecture.

Dewey Fullington of the Lehigh Portland Cement Co., Kansas City, Mo., was the principal speaker recently at a meeting of the Rotary Club at Carthage, Mo. His subject was "In Your World of Construction." He discussed modern building problems.

C. L. Doughman of the Lehigh Portland Cement Co., Kansas City, Mo., recently gave an illustrated lecture before the Lions Club at Sand Springs, Okla., on the "Construction Industry."

Clarence F. Pratt, commonly known in San Francisco as "Sandy" Pratt, former president of the Pratt Rock and Gravel Co., which was sold to the Pacific Coast Aggregates, Inc., has opened an office in the Monadnock Bldg., San Francisco, as advertising and sales promotion expert.

Walter S. Keith, former manager of the Standard Gypsum Co., Seattle, Wash., is now Seattle representative for "Peerless" white lime made by the Peerless White Lime Co., St. Genevieve, Mo.

Albert C. Lehman, president of Blaw-Knox Co., Pittsburgh, Penn., sailed for Europe recently on a ten-week business and pleasure trip abroad. While abroad he will attend conferences with heads of various subsidiaries of Blaw-Knox Co. in England, France, Germany and Italy.

William J. Linn, export manager of Cleveland Pneumatic Tool Co. and Cleveland Rock Drill Co., Cleveland, Ohio, has been made vice-president of the Cleveland Export Club.

Walter H. Wiewel has been made sales manager of Timken Steel and Tube Co., Canton, Ohio, replacing A. J. Sanford, resigned. Mr. Wiewel has been associated with the company for several years as manager of steel sales in New York City. He will now make his headquarters at Canton, Ohio.

Manufacturers

Lincoln Electric Co., Cleveland, Ohio, announces the removal of its Chicago office to 1455 W. 37th St.

General Refractories Co., Philadelphia, Penn., have announced the appointment of Davis Coal and Supply Co., Reading, Penn., as distributors for Grefco products in Schuylkill, Berks, Lebanon and the northern part of Lancaster counties, Penn.

Reliance Electric and Engineering Co., Cleveland, Ohio, has advanced L. M. Dunning to sales representative of the Chicago office. Herbert A. Holmes has been advanced to sales representative of the Pittsburgh office. This company manufactures electric motors.

Lidgerwood Manufacturing Co., Elizabeth, N. J., announces new distributor organization appointments comprising: Hedge and Mattheis Co., Boston; Brown-Bevis Co., Los Angeles; Edward R. Bacon Co., San Francisco; Funkhouser Equipment Co., Kansas City; and Thorman W. Rosholt Co., Minneapolis. Lidgerwood Company makes a complete line of hoists and kindred equipment.

Bay City Shovels, Inc., Bay City, Mich., announce a newly completed arrangement to have their complete line of shovels, cranes and excavators manufactured in Canada by John Inglis, Ltd., Toronto, Can. The sale of Bay City equipment made in Canada will be continued through the present Canadian distributors under the supervision of the home office at Bay City, Mich.

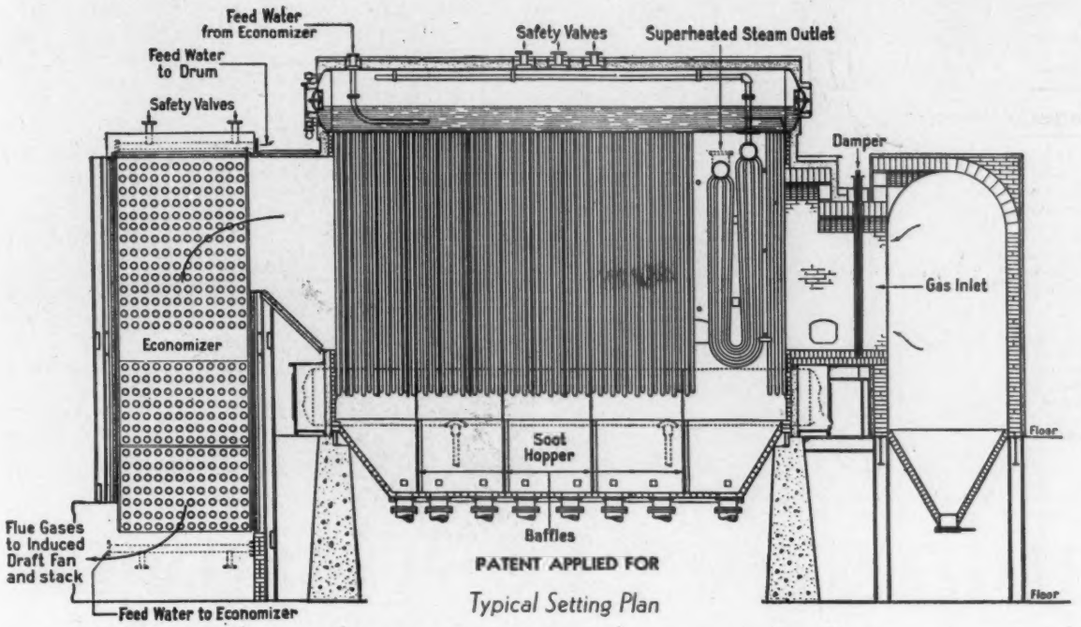
Gifford-Wood Co., Hudson, N. Y., announce the absorption of C. W. Hunt Co., Inc., West New Brighton, Staten Island, N. Y. Gifford-Wood Co. will manufacture and sell the complete line formerly produced by C. W. Hunt Co. and will operate that company as a division. The equipment includes bucket carriers, crushers, belt and flight conveyors, elevators, vibrating screens, chutes, gates, car pullers and similar items.

Worthington Pump and Machinery Corp., Harrison, N. J., announces the promotion of John A. Mair to the newly-established position of field engineer, and the appointment of A. F. Beres as personnel manager at the Buffalo works. Mr. Beres will represent the management of the Buffalo works in various phases of industrial relations; also employment, safety program and benefit association activities. Mr. Mair has been a member of the Buffalo works' staff since 1923, and has served as foreman of the two-cycle Diesel engine erection floor since 1929. His new duties will include periodic visits to plants where the company's products are in use or are being installed.

Production Equipment Co., Cleveland, Ohio, announces that any of the motorized speed reducers manufactured by them can be supplied with shafts extended at both ends of unit. For many applications this is particularly desirable. The motorized speed reducer consists of standard or special characteristic polyphase induction motors, mounted integral with spur, helical, planetary or bevel gears retained in an oil-tight housing. The low speed shaft from the speed reducer end provides a speed as low as 20 r.p.m. or may be supplied with a speed of as high as 875 r.p.m. The opposite shaft, direct from the motor, provides high speed of standard polyphase motor speeds of 1800, 1200, 900 or 720 r.p.m. For certain applications the unit can be supplied with speed reducers at both ends, thereby giving opposite shaft speeds alike or different from each other.

Ingersoll-Rand Co., New York City, announces that it has received orders for all air compressor and rock drilling equipment for the Hoover dam. The compressors will have a combined output of 75,000 cu. ft. per min. This equipment will be used for driving the four diversion tunnels which will carry the waters of the Colorado river around the project while the dam is under construction. They will be the largest rock tunnels ever driven for comparable distances, being 57 ft. in diameter. Four tubes almost the size of the Holland Vehicular Tunnel under the Hudson river could be placed in one of these tunnels. All told, 5,800,000 cu. yd. of rock will be excavated, requiring approximately 15,000 miles of drill holes.

A New Three Drum Waste Heat Boiler



PATENT APPLIED FOR

Typical Setting Plan

High Heat Transfer and Effective Dust Precipitation Methods are Features of the new Babcock & Wilcox Waste Heat Boiler

Babcock & Wilcox Boilers for utilizing the waste heat in gases from industrial processes have been built since 1874.

Details of this boiler will be gladly furnished upon request ... simply ask for Bulletin G-10.

The Babcock & Wilcox Company announces the creation of a new waste heat boiler of the three drum single-pass type which possesses several important features. Gases flow through the boiler in one horizontal pass, but the arrangement is such as to secure the effect of multiple passes, with a high rate of heat transfer and a draft loss that is unusually low.

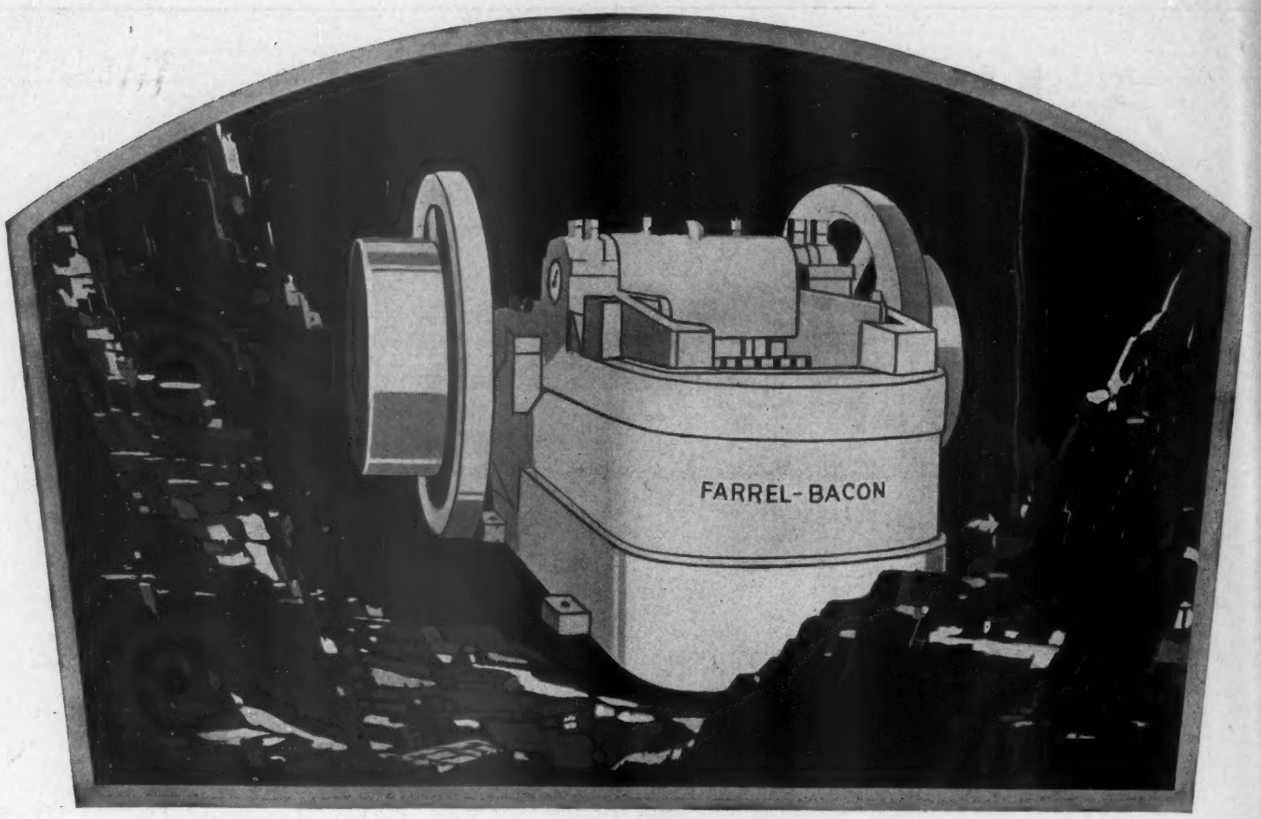
Dust precipitation is insured by the horizontal gas flow, vertical tubes, and a unique baffling system. Boilers of this type have operated for six months in cement mills with so little dust collection on the tubes that no increase in the draft loss could be detected by the usual gauges.

The upper drum and tubes are free to expand and contract without disturbing the steel casing or its refractory lining. Air infiltration is thus reduced to a minimum and the greatest source of brick troubles eliminated.

THE BABCOCK & WILCOX COMPANY

85 LIBERTY ST. NEW YORK, N. Y.

G-122



PRODUCTION COSTS LOWERED

with Farrel-Bacon Crushers

Standing out strongly among the features of Farrel-Bacon Crushers, the low cost of operation appeals at once to the quarry owner who would reduce overhead. The larger primary units show a reduction of ten to one, with even greater proportion in the medium and smaller sized crushers. Operation at high speeds is made possible by their rugged construction and simplicity of design.

You will make further savings in operation by consulting Bacon engineers on complete quarry equipment in addition to crushers. Revolving and vibrating screens, crushing and conveyor rolls, elevators, screening plants and many other types of modern machinery for the crushed stone industry are designed and furnished by Bacon.

We invite your inquiries and offer prompt cooperation in designing or remodeling your plant.

The Farrel-Bacon book illustrates and describes the Bacon line. Send your request for a copy.

FB CRUSHERS

FARREL-BACON CRUSHERS

EARLE C. BACON *Inc.*

Engineers to the Stone Crushing Industry

26 CORTLANDT ST., NEW YORK, N.Y.

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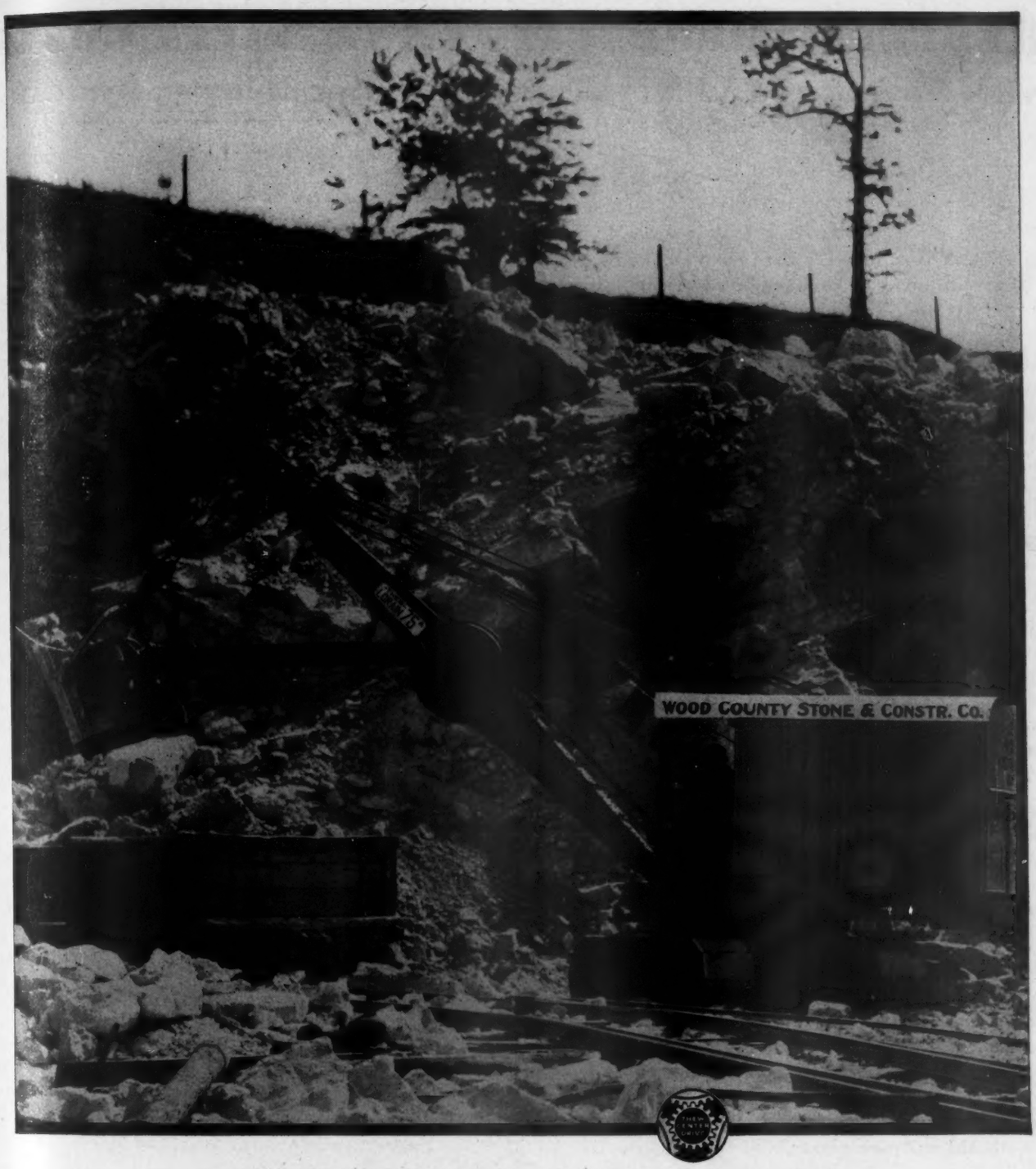

The Wood County Stone and Construction Company intended to use this 1¼ yd. Lorain 75 for stripping. An emergency caused them to put it to work loading hard Ohio Dolomite. • It has remained on the rock loading job ever since, because of its low cost of operation and powerful digging ability.

THE THEW SHOVEL COMPANY · LORAIN, OHIO

When writing advertisers, please mention ROCK PRODUCTS

Reducing Production and Sales Costs
with New Uses and New Types of Fuller-Kinyon Systems

MANY cement companies have met the special problems in production and sales, imposed by the recent abrupt changes in market conditions, by unusual applications and new types of Fuller-Kinyon Systems. Higher standards of quality, finer grinding (with consequent higher material temperatures) increasing use of special cements and the natural increase in bulk shipments are among the factors which have thrust new burdens upon plant operation. These new conditions have been met in many plants at little cost and with little change in equipment.

Too frequently Fuller-Kinyon Systems are taken as a matter of course. They are not merely cheaper and better substitutes for mechanical conveyors, but involve radically new functions and methods, unrestricted by straight-line materials handling and space limitations. Their unique features of layout and control have made them applicable to distinctly new uses, both in production and shipping departments.

The advantages of air separation and classification have been obtained with minor building changes, and no other change in the plant flow sheet. Separators have been installed in new as well as existing buildings, and all materials are delivered to and from them by Fuller-Kinyon Pumps.

Dry raw material mixing and blending systems, operating under complete automatic control, with a minimum of supervision, are producing cement of the highest quality, not exceeded by the best wet process practice. The economical advantages of dry plants are retained. It has been found that the basic method of this system is applicable to almost any local condition. Many of these systems are operating in both old and new plants.

Flue dust problems have been met in both old and new plants, and the dust has been handled at temperatures as high as 1000° F. In many dry plants it is effectively mixed in conjunction with the raw material mixing and blending system, without disturbing the analysis or kiln operating conditions. To wet process plants, where for mechanical or chemical reasons it is not feasible to return the dust to the slurry, attention is directed to the use of this dust as asphalt filler. This has been successfully accomplished, and the dust is pumped to and unloaded from standard box cars.

Although these systems have been used as standard equipment for conveying cement from mills to silos, particularly to take the best advantage of shipping facilities, recent installations have been refined to include remote control from the laboratory of the delivery to the various silo bins. This permits immediate delivery of different cements to the proper bins without contamination.

Water-jacketed transport lines have been supplied for reducing cement temperatures both before and after storage. This is of especial interest to plants now practicing or considering finer grinding.

Portable pumps for withdrawing cement from silos are arranged with automatic and remote control to keep packer bins full, or to by-pass bins for special cement shipments. Prompt shipments of standard, special and tested cements may be made without delay and handled alternately without the usual contamination. Branch lines of these systems are loading cars and boats in bulk without dust loss, mechanical loaders or hand labor. We believe this is the only method of loading standard cars, equipped with cross bulkheads as required by many contractors, to overcome spill and to avoid overhead cover.

New and completely portable Fuller-Kinyon Pumps for unloading bulk cement from standard box cars and barges are now serving construction contractors and central mixing plants.

A large number of self-loading and unloading vessels, equipped with Fuller-Kinyon Systems, are expanding cement markets by delivering large tonnages in bulk to silos and packhouses in large cities.

The Fuller Company also manufactures dust-tight rotary bin valves or gates, rotary air compressors and vacuum pumps. These compressors are available in a full range of capacities with pressures up to 170 pounds gauge.

Our Engineering Department is at your service, without obligation to you.

Fuller Company
CATASAUQUA, PENNA. U. S. A.

"PAYING PRACTICAL DIVIDENDS IN STEADY ALL-AROUND SERVICE"

. . . . *that's* WHY EVERY OWEN BUCKET PROVES A MONEY-MAKING INVESTMENT

Owen Buckets are rugged, day-after-day dependables. No matter what the conditions—no matter how difficult the material—or how big the job, Owen Buckets make good any and every time they are put to work. That means—in user's language—they pay a profit in actual work accomplished.

It's because Owen Buckets are constructed with the many demands of clamshell bucket jobs well in mind. Not for a too limited service—not over-specialized. It's the general all-around efficiency that assures the money-making value in every Owen—that never-failing ability to "do a bigger day's work than any other bucket of the same weight and capacity."

Write us for facts on how and where Owens are turning time into dollars saved. We'll also send literature that will show you some worthwhile bucket construction features.

The Owen Bucket Co., 6021 Breakwater Ave., Cleveland, Ohio

OWEN CLAMSHELL BUCKETS

Owen Buckets

Classified Directory of Advertisers in this Issue of Rock Products

For alphabetical index, see page 136

This classified directory of advertisers in this issue is published as an aid to the reader. Every care is taken to make it accurate, but ROCK PRODUCTS assumes no responsibility for errors or omissions. The publishers will appreciate receiving notice of omissions or errors, or suggestions

Aerial Wire Rope Tramways (See Tramways, Aerial Wire Rope)

Agitators, Thickeners and Slurry Mixers
The Dorr Co.
Hardinge Co., Inc.
F. L. Smidth & Co.

Air Compressors
De Laval Steam Turbine Co.
Fuller Company
Nordberg Mfg. Co.
Traylor Eng. & Mfg. Co.
Worthington Pump & Machinery Corp.

Air Filters
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Northern Blower Co.

Air Separators
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Kent Mill Co.
Northern Blower Co.
Parsons Engineering Corp.
Raymond Bros. Impact Pulv. Co.
Sturtevant Mill Co.
Universal Road Machinery Co.

Automatic Weighers
Merrick Scale Mfg. Co.

Babbitt Metal
Jos. T. Ryerson & Son, Inc.

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Bucyrus-Erie Company
Ohio Power Shovel Co.

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Hardinge Co., Inc.
F. L. Smidth & Co.

Batchers
Blaw-Knox Company

Belting
Hitchcock Co., Inc. (Repair)
New York Belting & Packing Co.
Robins Conveying Belt Co.
Thermoid Rubber Co.

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Blaw-Knox Company
Burrell Eng. & Const. Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.

Bin Gates
Easton Car & Construction Co.
Fuller Company
Industrial Brownhoist Corp.
Robins Conveying Belt Co.
Traylor Eng. & Mfg. Co.

Blast Hole Drills (See Drills)

Blasting Machines
Atlas Powder Co.
E. I. du Pont de Nemours Co., Inc.
Illinois Powder Mfg. Co.

Blasting Powder (See Powder, Blasting)

Blasting Supplies
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.
Illinois Powder Mfg. Co.

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Sauerman Bros.

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De Laval Steam Turbine Co.

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Dardelet Threadlock Corp.

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Smith Engineering Works

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Harbison-Walker Refractories Co.

Brick (High Alumina)
General Refractories Co.
Harbison-Walker Refractories Co.

Brick (Insulating)
General Refractories Co.

Brick Machinery (Sand Lime and Slag)
Jackson & Church Co.

Bucket Conveyors (See Conveyors and Elevators)

Buckets, Clamshell (See Buckets, Grab, Clamshell, etc.)

Buckets (Dragline and Slackline)
Bucyrus-Erie Co.
The Owen Bucket Co.
Sauerman Bros.

Buckets (Dredging and Excavating)
The Owen Bucket Co.

Buckets (Elevator and Conveyor)
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Robins Conveying Belt Co.
W. Toepfer & Sons Co.

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Blaw-Knox Company
Industrial Brownhoist Corp.
Link-Belt Co.
The Owen Bucket Co.

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Blaw-Knox Company

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General Electric Co.
Interstate Equipment Corp.
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Sauerman Bros.
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Easton Car & Construction Co.

Cars (Quarry and Gravel Pit)
Davenport Loco. & Mfg. Corp.
Easton Car & Construction Co.

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Vulcan Iron Works (Iron and Steel)

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General Refractories Co.

Cement (High Temperature)
General Refractories Co.
Harbison-Walker Refractories Co.

Cement (Plastic)
General Refractories Co.

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Fuller Company

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Bethlehem Foundry & Machine Co.
Link-Belt Company

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Hitchcock Company, Inc.
F. L. Smidth & Co.

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Robins Conveying Belt Co.

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Clamshell Cranes (See Cranes)

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Hardinge Co., Inc.

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Bradley Pulverizer Co.
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De Laval Steam Turbine Co. (Flexible)
Philadelphia Gear Works

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Cranes (Locomotive)
(See Cranes Crawler and Locomotive)

Cranes (Overhead Traveling Electric)
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Harnischfeger Corporation
Industrial Brownhoist Corp.

HERCULES ENGINES

HERCULES, for years, has anticipated each step in the development of heavy-duty power requirements. And Hercules has been ready to meet each exacting need, as it has arisen, with engines of simple design, advanced engineering and rugged build. Today the Hercules line embraces Six Cylinder and Four Cylinder Engines graduating in size from 15 to 175 H. P.—while Hercules customers include leading manufacturers of shovels, cranes, hoists, mixers, pavers, pumps, compressors, stone crushers and other powered equipment, as well as commercial vehicles, buses, agricultural and oil field machinery.

HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.

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Mid-Continent Office: Mayo Building, Tulsa, Oklahoma
West Coast Office: Russ Building, San Francisco, California

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 136

Crusher Parts
Earle C. Bacon, Inc.
The Frog, Switch & Mfg. Co.

Crushers (Hammer)
Pennsylvania Crusher Co.
Sturtevant Mill Co.

Crushers (Jaw and Gyratory)
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Thew Shovel Co.

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Link-Belt Co.
Sauerman Bros.

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Harnischfeger Corporation
Ohio Power Shovel Co.
Thew Shovel Co. (Electric, Gasoline and Steam)

Drag Scrapers (See Scrapers, Power Drag)

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Dredge Pipe (See Pipe)

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Worthington Pump & Machinery Corp.

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Sanderson Cyclone Drill Co.
Worthington Pump & Machinery Corp.

Drills (Well) (See Drills, Blast Hole)

Drives (See Gears, Chain Drives, etc.)

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Worthington Pump & Machinery Corp.

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Dust Blowers
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Elevator Buckets (See Buckets—Elevator)

Elevators (See Conveyors and Elevators)

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Power Mfg. Company

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Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

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Fuller Lehigh Company

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Filtration Engineers Inc.

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Thermoid Rubber Co.

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De Laval Steam Turbine Co.
Philadelphia Gear Works

Gears and Pinions
Bethlehem Fdy. & Machine Co.
The Frog, Switch & Mfg. Co.
General Electric Co.
Philadelphia Gear Works
Westinghouse Elec. & Mfg. Co.

Gear Reducers
Philadelphia Gear Works
Westinghouse Elec. & Mfg. Co.

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Generating Sets (Diesel Electric)
Fairbanks, Morse & Co.

Generators (See Motors and Generators)

Grab Bucket Cranes (See Cranes)

Grab Bucket Hoists (Monorail) (See Cranes)

Grab Buckets (See Buckets, Grab, Clamshell, etc.)

Graphite Facings
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Blaw-Knox Company

Grease
Alemite Corp.
Joseph Dixon Crucible Co.

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Philadelphia Steel & Iron Co.

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Lewistown Fdy. & Mach. Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Traylor Eng. & Mfg. Co.

Guns (Hydraulic)
Taylor Forge & Pipe Wks.

Gypsum Plaster Plants
J. B. Ehrsam & Sons Mfg. Co.

Gyrating Screens (See Screens)

Hammer Mills (See Crushers)

COLVULC

REG. U. S. TRADE MARK

The plastic rubber that is saving Great Eastern Gravel thousands of dollars annually....

Great Eastern Gravel Corporation

PLANT PORT JEFFERSON LONG ISLAND — TELEPHONE Port Jefferson 248

GRAVEL AND SAND PRODUCTS

PORT JEFFERSON, N. Y.

GRAVEL AND SAND MIXTURE — GRAVEL — GRIT — SAND

March 2nd, 1931

THE HITCHCOCK COMPANY, Inc.
#461 Park Square Bldg.,
Boston, Mass.

Gentlemen:-

We operate a large suction dredge, with 20" centrifugal pump, for the production of commercial sand and gravel, washing and screening all material on board the boat. Approximate 500 cubic yards of solid materials per hour is discharged with considerable force onto a spreading table to be led to the screens.

Our materials are quartz formation and unusually abresive. This spreading table has heretofore been covered and lined with 1/4" steel plate, which would last three to four weeks. Four months ago we covered this spreading taole with your Colvulc nearly 1/2" thick and at this date it shows no wear whatsoever and will apparently last for years.

Our expense for steel plate was about $4000.00 per year and we feel safe in stating this Colvulc product will show a saving of 60 to 75% if it wears but a year, which is very conservative.

Very truly yours,

GREAT EASTERN GRAVEL CORP.

VICE PRESIDENT

JTH

CAN SAVE YOU PLENTY OF MONEY, TOO

COLVULC is much more than a "patching" compound. It is both a restorative and a preventive. It restores worn conveyor belts to many more months, even years, of full service by giving them a new covering at the worn places. It prevents further destruction at these points. ■ Chutes lined with COLVULC resist abrasion to a marked degree beyond that of the metal or wood itself. Baffles and loading plates are practically immune to wear, as witness the experience of Great Eastern Gravel, quoted in the letter. ■ COLVULC is plastic and easily applied by any intelligent workman. It is molded into place cold and cures cold. Its initial cost is lost sight of in the hundreds, even thousands, of dollars saved by the elimination of excessive maintenance and replacements. ■ Order, for a trial, say 50 or 100 pounds of COLVULC. Re-cover a worn belt or line some chutes and then note how further destruction is checked. In ordering, give full details of equipment to be protected.

Showing a conveyor belt re-covered with COLVULC *and ready for many more months of service.*

THE HITCHCOCK COMPANY

INCORPORATED

PARK SQUARE BUILDING — BOSTON, MASS.

COLVULCANIZE *to Economize*

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Worthington Pump & Machinery Corp.

High Alumina Brick (See Brick) (High Alumina)

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Harnischfeger Corporation
Sauerman Bros.
Vulcan Iron Works (Elec. and Steam)

Hoists (Skip) (See Skip Hoists and Skips)

Hose Couplings (See Couplings)

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McGann Mfg. Co., Inc.
Vulcan Iron Works

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General Refractories Co.

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Linings (Iron for Ball and Tube Mills) (See Mill Liners)

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Plymouth Locomotive Works

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You Can Be Sure of a Full Dipper Every Swing With a LIMA "101"

IF you are to make a profit on your next job, naturally you must have an excavator that will produce big yardages at minimum expense. LIMA "101" excavators are fast and powerful, and are built oversize to permit a full dipper every swing in the hardest material. Timken roller bearings at every important bearing point insure perfect alignment of shafts and drums. No chattering or grabbing of clutches to cut down the efficiency of the machine.

Many other features of importance are outlined in our bulletin. Write for a copy today.

THE OHIO POWER SHOVEL CO., LIMA, OHIO

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LIMA "101"

The only shovel in the world equipped throughout with anti-friction bearings --a Timken at every vital bearing point.

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Worm Gears (See Gears)

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Alemite Announces Specialized Lubrication Planning Service Now Available to Manufacturers Everywhere. Unique Service Accomplishes Amazing Results—Costs Users Nothing

The Alemite Corporation—recognized as the world leader in industrial lubrication—offers a new, important service to American Industry. It is the Alemite Specialized Lubrication Planning Service—and it costs you nothing. Yet it may result in saving your company thousands of dollars—in manufacturing costs, equipment repairs, spoilage of product, loss of time.

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Today through a nation-wide organization we offer this invaluable experience and scientific knowledge to American Industry in the form of a Planning Service based upon a study of *your* individual problems in lubrication—whether this involves a single bearing or your entire plant. It is not a set formula but a plan specially designed to meet each individual problem.

What the Service Does

Men with an intimate knowledge of the problems in *your* industry—are maintained by Alemite organizations in 49 chief distribution centers throughout the country. On your request—one of these lubrication experts will come to your plant. He will study your problems—large or small. Based on the facts he finds, we will offer a definite, tangible plan to remedy the problem. Accepting or rejecting this plan will rest with you. You are not obligated to buy.

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Your request will bring an Alemite representative, competent to discuss details of the new Alemite Specialized Lubrication Planning Service and what it will do for you. Your request obligates you in no way.

ALEMITE

High Pressure Lubrication

ALEMITE CORPORATION 443
(Division of Stewart-Warner)
2688 N. Crawford Ave., Chicago.

Please send your representative to our office (or send complete details of your plan.)

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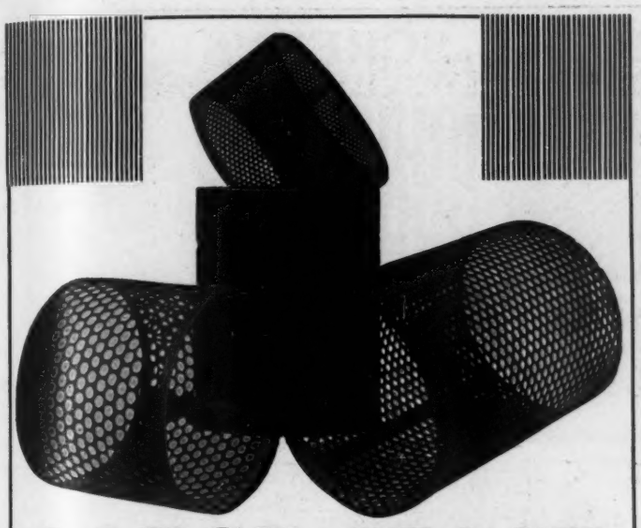


LARGE STOCK

WE carry a large stock of High Carbon Steel Plates of all popular sizes, at all times.

These we perforate for any size or shape screen to meet individual requirements. TOEPFER Products include: Revolving Screens—Elevators—Feeders—Sand Washers and Perforated Metals.

W. TOEPFER & SONS CO.
2547-2561 N. Thirtieth St. Milwaukee, Wis.

THE above illustration is typical of the many applications of the Track Machine used for shifting track on waste dumps of quarries, open pit mines, construction jobs—wherever track must be shifted laterally. On all shifting and raising work, it takes the place of men working with jacks and bars.

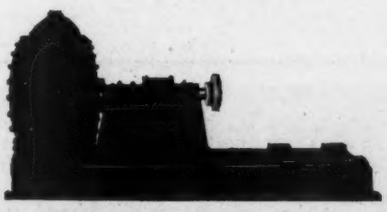
Write for Bulletin KS-8

NORDBERG MFG. CO. MILWAUKEE, WISCONSIN

THE NORDBERG PATENTED TRACK MACHINE

H&B

CONSTRUCTION ENGINEERS
HYDRAULIC DREDGES
PUMPS
DREDGING MACHINERY



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INDIANAPOLIS, INDIANA

Most Economical

Valuable Book Free

Gives complete information on concrete pipe, cost of production, methods of construction, standards of strength and wall thickness, etc. Write for your copy today.

Way of making quality Concrete Pipe. Quinn Heavy Duty Forms are easy to fill. Hold their shape, assuring tile of uniform thickness. Machine-planed joints, eliminating "bleeding" at the joints, and other features make Quinn forms most efficient, and cut the cost of producing concrete pipe in all sizes.

Quinn Wire & Iron Works
1611—12th Street
BOONE IOWA

THE editorial library of Rock Products contains practically every obtainable treatise relating to the production of stone, sand, silica, phosphate rock, gypsum and other non-metallic minerals and on the manufacture of cement, lime, gypsum products, etc. The editors are technical men and are familiar with these books. Our library of manufacturers' literature is as complete and up-to-date as possible. Rock Products welcomes inquiries, and our facilities are ever at the disposal of our subscribers and advertisers.

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Shovels or Cranes

FOR SALE

1—Factory rebuilt Lima 1¼ cu. yd. capacity. This machine can be equipped with either shovel, clamshell, dragline or drag shovel attachments. Very reasonably priced. Carries new machine guarantee. Located at New York.

1—Gas-Air Erie shovel 1 yd. capacity A-1 condition. Ready for service. Located Richmond, Va.

1—Type B Erie Shovel or clamshell machine. Good condition, Newark, N. J.

Complete Shovel Attachment for Type "O" Thew, located Buffalo, N. Y. Also, attachment for Type B and B-2 Eries located in New Jersey. Decided bargains.

P & H 1¾ yd. gas shovel. Excellent condition, very attractive price. Located South Kearny, N. J.

1—Linn Tractor, 6-yd. capacity, with Waukesha Motor. Machine in very good condition. Priced to sell quickly. Located New York State.

We have both Steam and Gasoline Excavators ranging from ½ to 1½ cu. yd. capacity in various parts of the country that will be sold at extremely low prices or leased with leased payments made applying on purchase price.

~

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Lima Trust Bldg.
Tel. Main 4824

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317 Frelinghuysen Ave.
Newark, N. J.
Tel.: Waverly 2—0640

Wire or phone at our expense.

IN STOCK

150—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge; rails, new and relaying and all sorts of tracks supplies of all sections. Also gasoline locomotives, 24" and 36" gauge and batch box cars in good serviceable condition, as well as portable track to go with same.

M. K. FRANK 220 East 42nd Street, New York
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LOCOMOTIVE CRANES

25-ton Browning 8-wheel 2-line, 50' boom.
30-ton Ohio 8-wheel 2-line, 70' boom.

LOCOMOTIVES

55-ton 17x24" Vulcan 4-wheel saddle tank, Ohio standard boiler.
21-ton 11x16" Vulcan 4-wheel saddle tank, National Board boiler. (Two duplicate.)
50-ton 16x24" American 4-wheel saddle tank.
33-ton 13x18" Porter 4-wheel saddle tank.
72-ton 20x26" American 6-wheel switcher.
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75—4 yard Western Heavy Duty, 36" gauge.
12—5 yard Western Heavy Duty, 36" gauge.

Our stock also includes many other locomotives, locomotive cranes, shovels, cars, etc. Complete list on request.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Box 391 Birmingham, Alabama

FOR SALE

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